

## SBFis ePoster Abstracts/Resumos



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**A FISIOLOGIA MULTICÊNTRICA E A  
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## SBFIS ePoster Abstracts / Resumos

ID: 4145

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### IMPACT OF PEDF GENE THERAPY DELIVERED BY AAV8 IN MURINE MODEL OF CHRONIC ALLERGIC INFLAMMATION

Asthma is a chronic inflammatory disease that affects the lungs, often associated with a remodeling process with airway obstruction and impaired lung ventilation. So far, there is no treatment capable of reversing or minimizing such structural changes, making it necessary to search for new therapeutic strategies. Gene therapy emerges as a promising alternative for the treatment of respiratory diseases, as the lung is an easily accessible organ. Vectors derived from adeno-associated virus (AAV) are efficient in the transduction of airway epithelium with minimal toxicity and immunogenicity, thus, being important tools for the treatment of lung diseases. It has been shown that tyrosine residues exposed on the capsid are targets for phosphorylation, and subsequent viral particle ubiquitination and destruction via proteasomes. Mutations in the gene that result in substitution of tyrosine to phenylalanine residues (Y733F) have been shown to protect the vector of such degradation, increasing the efficiency of transduction. The pigmented epithelium derived factor (PEDF) has antiangiogenic, anti-inflammatory and anti-fibrotic activities and would be promising for the treatment of inflammatory diseases that affect the lungs. Therefore, the present study evaluated the effects of gene therapy with human PEDF (hPEDF) through Y733F-AAV8 (AAV8-PEDF) on the inflammatory process and remodeling of the lung parenchyma in a murine model of chronic allergic inflammation. Female C57BL/6 mice were initially divided into 2 experimental groups: a) control group (CTRL), challenged with saline solution (0.9% NaCl) intranasally; b) House Dust Mite group (HDM), challenged with 25µg of purified domestic dust mite (*D. pteronyssinus*, Greer Laboratory, Lenoir, NC, USA), diluted in 25 µl of sterile PBS, intranasally. The CTRL and HDM groups were also divided into 2 groups. The CTRL group was subdivided into: a) control- saline group (C-SAL), treated with saline, intratracheally; b) control- PEDF group (C-PEDF), treated with AAV8-PEDF ( $10^{10}$  vg), intratracheally. The HDM group was subdivided into: a) HDM-Saline group (HDM-SAL), instilled with saline, intratracheally; b) HDM-PEDF group, instilled with AAV8-PEDF ( $10^{10}$  vg), intratracheally. Key parameters such as hPEDF gene expression in animals' lung tissue were explored (RT-PCR). The airway hyperresponsiveness (methacholine dose response curve) and *in vivo* respiratory mechanics analysis (end-of-inspiration occlusion method) were investigated. In addition, the morphometry and cellularity of the lung parenchyma (optical microscopy); Also, the bronchoconstriction index and the mucus production (Periodic Acid-Schiff Staining) by goblet cells were estimated. Moreover, the content of collagen fibers (Masson's Trichrome Staining Method) in the airways and parenchyma, as well as the expression of smooth muscle  $\alpha$ -actin (Immunohistochemistry) in the terminal bronchioles and alveolar ducts were quantified. The analysis showed that Y733F-AAV8 vector was efficient in delivering the hPEDF gene to lung cells after *in vivo* instillation. Gene therapy with PEDF was able to reduce lung inflammation and airway remodeling, improving lung function. These findings suggest that gene therapy with AAV8- PEDF is promising for the treatment of allergic asthma, providing curative means to reverse asthma remodeling and, potentially, other lung diseases with inflammation and fibrosis.

ID: 4302

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### THE BENEFICIAL EFFECTS OF SODIUM NITRATE ( $\text{NaNO}_3$ ) TREATMENT IN CARDIOMETABOLIC CHANGES OBSERVED IN DIABETIC-STZ MICE

Chronic hyperglycemia is associated with vascular and metabolic dysfunctions. There is deregulation in the nitric oxide metabolism in diabetic animals. Recent studies have investigated the action of inorganic nitrates ( $\text{NO}_3^-$ ) in the treatment of this disease. We aimed to evaluate the effect of sodium nitrate ( $\text{NaNO}_3$ ) treatment in the cardiometabolic changes observed in diabetic STZ (DB/STZ) mice. Toward this point, after induction of diabetes mellitus (STZ ip 50 mg.kg/dia/5 days), male mice C57Bl6 (7 weeks old) were treated for 14 days with  $\text{NaNO}_3$  (85 mg/L) in drinking water. Data was expressed on average $\pm$ SEM and analyzed by the One-way or Two-way test (Graphpad Prism, v.06),  $p < 0.05$ . CEAU/UFPB n°9387160419. Results showed that DB/STZ increased fasting glycemia ( $490 \pm 18$  vs  $347 \pm 19$  mg/dl,  $n=8$ ) which was reduced by  $\text{NaNO}_3$  ( $356 \pm 26$  vs  $490 \pm 18$  mg/dL,  $n=8$ ).  $\text{NaNO}_3$  increased body weight ( $25.25 \pm 1.06$  vs  $22.25.01 \pm 0.88$  g,  $n=8$ ), glucose tolerance ( $460.66 \pm 33.92$  vs  $564.40 \pm 14.88$  mg/dL,  $n=6$ ) and insulin sensitivity ( $112.33 \pm 11.76$  vs  $358 \pm 54.69$  mg/dL,  $n=6$ ) in DB/STZ.  $\text{NaNO}_3$  decreased feed consumption ( $1.94 \pm 0.41$  vs  $3.01 \pm 0.19$  g/10g/24h,  $n=6$ ) and water ( $5.60 \pm 1.38$  vs  $10.82 \pm 1.01$  mL/10g/24h,  $n=6$ ) and urine volume ( $0.36 \pm 0.06$  vs  $0.52 \pm 0.44$  mL/10g/4h,  $n=7$ ) in DB/STZ. Furthermore,  $\text{NaNO}_3$  reduced oxidative stress in the liver ( $15.37 \pm 2.55$  vs  $22.03 \pm 1.61$  mmol/ml,  $n=7$ ) but did not change in serum ( $20.27 \pm 1.37$  vs  $23.98 \pm 2.70$  mmol/ml,  $n=6$ ) and in the pancreas ( $9.96 \pm 1.35$  vs  $12.35 \pm 1.16$  mmol/ml,  $n=6$ ) of DB/STZ. DB/STZ increased the maximal response ( $E_{max}$ ) and potency ( $EC_{50}$ ) to Phe which was attenuated by  $\text{NaNO}_3$  in aortic with and without endothelium. In aorta with endothelium DB/STZ reduced  $E_{max}$  and  $EC_{50}$  to ACh and  $\text{NaNO}_3$  did not change that response. In aorta without endothelium DB/STZ reduced  $E_{max}$  to SNP but was increased with  $\text{NaNO}_3$ . DB/STZ increased the mean blood pressure ( $119 \pm 1.5$  vs  $102 \pm 1.8$  mmHg) but this increase was prevented with  $\text{NaNO}_3$  ( $115 \pm 0.9$  vs  $119 \pm 1.5$  mmHg). Our results showed that  $\text{NaNO}_3$  treatment promoted beneficial cardiometabolic effects in DB/STZ mice.

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Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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## **WHITE BEANS (*Phaseolus vulgaris* L.) AS FUNCTIONAL FOOD IMPROVES GLUCOSE DYSFUNCTION HOMEOSTASIS AND HYPOTHALAMIC INFLAMMATION IN EARLY OVERFEEDING-INDUCED OBESE RATS**

Obesity, a chronic non-communicable disease, is one of the major public health problems worldwide. We aimed to evaluate effect of white bean flour (*Phaseolus vulgaris* L., PV) as dietary supplementation on glucose homeostasis and hypothalamic inflammatory markers in rats early overfeeding. On the 3rd day after birth, litter size was adjusted to 8 (control, CONT) or 3 rats per mother (small litter, SL). At 22-days old, rat offspring was weaned and fed a standard diet (CONT-SD and SL-SD) or a standard diet supplemented with 2.5% of PV (CONT-PV and SL-PV). At adulthood, rats underwent intraperitoneal glucose tolerance test (ipGTT), and then body weight and Lee index were accessed and rats euthanized to collect hypothalamus to measure inflammatory markers. The protocols were approved by the Ethics Committee (23108.089573/2020-23). In relation to CONT-SD rats, body weight of SL-SD rats was 15% higher ( $P<0.01$ ), while SL-PV rats display body weight 9.5% smaller than SL-SD ( $P<0.01$ ). The Lee index of SL-SD rats was 5.6% higher than CONT-SD ( $P<0.05$ ); while it was 4.7% smaller in SL-PV rats compared to SL-SD ( $P<0.05$ ). The SL-SD rats were hyperglycemic (19%,  $P<0.01$ ) when compared to CONT-SD rats, on the other hand SL-PV rats presented a reduction of 11.4% in fasting glycemia compared to SL-SD rats ( $P<0.01$ ). The area under the glycemia curve during ipGTT showed that SL-SD rats were glucose intolerant, in relation to CONT-SD (29%,  $P<0.01$ ), while this parameter in SL-PV rats was reduced by 15% when compared to SLSD ( $P<0.01$ ). Regarding hypothalamic inflammatory markers, SL-SD display higher TNF- $\alpha$  (55%,  $P<0.01$ ), IL-10 (35%,  $P<0.01$ ) and IL-6 (94%,  $P<0.01$ ), without changes in IL-1 $\beta$ . On the other hand, compared to SL-SD rats all these parameters were reduced in SL-PV (TNF- $\alpha$ , 30%,  $P<0.01$ ; IL-10, 27%,  $P<0.05$  and IL-6, 27%,  $P<0.05$ ). Early overfeeding programs glucose intolerance and hypothalamic inflammation, which are improved by the chronic dietary supplementation with PV.

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Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## **SENESCENT CELLS CLEARANCE EXACERBATES THE BENEFICIAL EFFECTS OF MIR-22 DELETION IN WHITE ADIPOSE TISSUE OF OBESE MICE**

The accumulation of senescent cells in the white adipose tissue (WAT) occurs in natural aging, as well as in obesity. Although cellular senescence is a known risk factor for several chronic diseases, the mechanisms controlling WAT senescence are not fully understood. Recent studies have revealed the role of microRNAs in regulation of cellular senescence. Previously, we have shown the beneficial effects of miR-22 deletion in obesity. Here, we investigated the role of miR-22 in cellular senescence of WAT and the effects of senescent cells removal in obesity. Male wild type (WT) and miR-22 knockout (miR-22KO) mice (5 weeks) were treated with standard diet (control group) or high-fat diet (60 kcal% fat; HF group) for 16 weeks. To investigate the impact of senescent cells clearance, obese mice were treated with senolytics (Dasatinib 5 mg/kg + Quercetin 50 mg/kg) for 4 weeks (3 doses/week) before the end of

diet treatment. The efficacy of senolytics treatment was assessed by  $\beta$ -galactosidase ( $\beta$ -gal) activity in perigonadal WAT (pWAT). Senolytics treatment did not change body weight between groups ( $31.80 \pm 2.6$  vs.  $36.33 \pm 1.20$ ;  $n=3-5$ ). Both miR-22 deletion and senolytics treatment prevented the increased  $\beta$ -gal activity in response to HF diet in pWAT. In addition, miR-22KOHF group treated with senolytics had a longer telomere length in pWAT compared to WTHF group treated with senolytics ( $1.45 \pm 0.03$  vs.  $0.78 \pm 0.13$ ;  $n=3$ ). The expression of p53 - a senescence marker - was decreased in pWAT of miR-22KOHF group and in both groups treated with senolytics compared to that found in WTHF group ( $75.86 \pm 34.86$ ;  $29.07 \pm 1.95$ ;  $24.15 \pm 15.03$  vs.  $100 \pm 29.97$ ;  $n=3$ ). Interestingly, senolytics therapy potentiated the lower WAT gain in response to HF diet in miR-22KO mice ( $35.42 \pm 6.60$  vs.  $76.90 \pm 11.09$ ;  $n=4-6$ ). In conclusion, these results indicate that senolytics treatment exacerbates the beneficial effects of miR-22 deletion against obesity-induced expansion of WAT.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **miRNA-143-3P-SOX6-MYH7 PATHWAY IS ALTERED IN OBESOGENIC DIET-INDUCED CARDIAC HYPERTROPHY IN FEMALES**

Obesity can lead to dyslipidemia, type 2 diabetes, hypertension and cardiovascular diseases. Several mechanisms have been implicated in the cardiovascular complications associated with obesity, including the microRNAs (miRNAs). In this sense, we investigated the effect of obesogenic diet in the expression of miRNAs involved in cardiac remodeling in female mice. We demonstrated that obesogenic diet induced several metabolic disorders, such as increased body weight gain, adiposity, glucose intolerance, insulin resistance, and dyslipidemia. Obese females also exhibited cardiac hypertrophy and impaired left ventricle relaxation, accompanied by increased levels of several miRNAs involved in cardiac remodeling, including miR143-3p, which was the most upregulated miRNA in the obese female heart. Bioinformatic analysis revealed Sox6, a regulator of Myh7 transcription, as a predicted target of miR-143-3p. Obese females exhibited decreased levels of Sox6 and increased expression of Myh7 in the heart. Loss of-function studies in cardiomyocytes revealed that inhibition of miR-143-3p increased Sox6 mRNA levels and reduced Myh7 expression. Collectively, we demonstrate, for the first time, that obesogenic diet increases the expression of diverse miRNAs involved in cardiac remodeling in female mice. Furthermore, our results suggest that miR-143-3p-Sox6-Myh7 pathway may play a key role in obesity-induced cardiac hypertrophy and impaired left ventricle relaxation in females.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **CAN A LOW-PROTEIN DIET DURING PUBERTY IMPAIR THE ENDOTHELIAL FUNCTION IN THE ADULTHOOD?**

It has been described that low-protein diet during early phases of body development, such as intrauterine life and childhood, can favor the development of vascular disorders. However, it has not been evaluated the vascular endothelial function of adult rats exposed to low-protein diet during puberty. The study aimed to evaluate if rats fed with a low-protein diet during puberty present endothelial dysfunction in the adulthood and a possible mechanism involved. Male Wistar rats from postnatal day 30 to 60 received either regular rodent diet with 23% of protein (CTR group) or lowprotein diet with 4% of protein (LP group). At postnatal day 120, the in vitro thoracic aorta reactivity to phenylephrine was evaluated in the presence or absence of endothelium (E+, E-), indomethacin, apocynin or tempol. The maximum response (Rmax, g) and pD2 (-log of the concentration of the drug that causes 50% of the Rmax, data not shown) were calculated. The aortic amount of lipid peroxidation (reaction of thiobarbituric acid reactive substances (TBARS test, nmol/mg protein)). The catalase activity was evaluated by hydrogen peroxide degradation (mmol/min/mg of protein). The data were analyzed by ANOVA (one or two-ways and Tukey's) or independent T-test; the results were expressed as mean  $\pm$  s.e.m., differences when  $p < 0.05$ . (CEUA/UEL 144/2019). The Rmax to phenylephrine in aortic E+ rings of LP ( $2.49 \pm 0.13$ ,  $n=9$ ) was increased when compared with the one in the CTR ( $1.51 \pm 0.087$ ,  $n=10$ ). Apocynin reduced Rmax to phenylephrine in LP E+ rings ( $1.69 \pm 0.19$ ,  $n=8$ ) but not in CTR ( $2.14 \pm 0.18$ ,  $n=7$ ). Indomethacin and tempol did not interfere with the aortic contraction in both groups (data not shown). The catalase activity was lower in LP ( $29.00 \pm 2.28$ ,  $n=8$ ) than in CTR ( $47.03 \pm 6.60$ ,  $n=6$ ), the TBARS concentration was similar between groups (data not shown). It is possible to conclude that protein restriction during puberty causes endothelial dysfunction in adulthood by a mechanism related with oxidative stress.

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Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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### **TOPIRAMATE EXPOSURE DURING CHILDHOOD FAVOR DE DEVELOPMENT OF VASCULAR DYSFUNCTION IN MALE AND FEMALE WISTAR RATS**

Introduction: Topiramate (TOP) is a drug used to treatment of epilepsy in children older than 2 years. Recently, the use of this drug in children has been associated with increased vascular risk markers. However, the late repercussions of TOP exposure on the vascular system have not been investigated. Aim: to evaluate the vascular function of adult rats exposed to TOP during childhood. Methods: Male and female Wistar rats were exposed to TOP (41mg/kg/day) or water by gavage during childhood (postnatal day, 16-28). In the adulthood, the thoracic aorta reactivity to phenylephrine (phenyl) was evaluated in the presence (Endo+) or absence (Endo-) of endothelium, as well as, the role of endothelium-derived contractile factors were investigated using the blockers: apocynin, tempol, indomethacin and NS398. The comparison between groups was made using the maximum response (maxR, grams) for the agonist.

The aortic thickness and expression of cyclooxygenases, NOX2 and p47<sup>phox</sup> were evaluated by histology and western blot, respectively. [CEUA/UJEL: 100/2018]. Results: when compared to the control rats, the Endo+ aortic rings from adult TOP male rats showed an increase in maxR for phenyl [CTR:1.99 ± 0.20(9) vs TOP: 2.87 ± 0.12(11)] and Endo- [CTR:4.10±0.08(12) vs TOP:4.72±0.17(10)] rings, while adult TOP female rats showed higher maxR in Endo+ [CTR:1.34±0.13(10) vs TOP:1.95±0.17(10)] rings. In TOP male rats, apocynin [2.28±0.13], indomethacin [2.09±0.14] and NS398 [1.80±0.18] restored maxR to phenyl. Also, TOP male rats presented aortic hypertrophy and increased aortic expression of NOX2 and p47<sup>phox</sup>. In Endo+ aortic rings of TOP female rats, indomethacin [1.28±0.10] and NS398 [1.49±0.13] restored maxR to phenyl. In addition, TOP female rats showed increased COX2 aortic expression. Conclusion: The exposure to topiramate during childhood favor the development of vascular dysfunction in the adulthood, and the mechanism related with the vascular dysfunction is sex-specific.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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#### HYPOTHALAMIC ANGIOTENSINERGIC AT1 RECEPTOR mRNA EXPRESSION AND ANGIOTENSIN II RESPONSES IN FEMALE SHR TREATED WITH ESTRADIOL

Hypertension is one of the most prevalent non-communicable diseases in the world. The spontaneously hypertensive rat (SHR), an animal model of primary hypertension, ingests more NaCl than normotensive strains. Estrogens have significant influence on cardiovascular regulation and hydromineral balance. We have shown that estrogens reduce NaCl intake and palatability in female SHRs, but we do not know whether such an effect involves the brain renin-angiotensin system (RAS). Here we investigated: 1) the expression of hypothalamic RAS components, 2) central angiotensin II-induced pressor and drinking responses in female SHRs treated with estradiol. Adult ovariectomized (OVX) female SHRs with a guide cannula implanted in the lateral ventricle (LV) and a femoral artery catheter were used (CEUA/FOAr protocol 51/2014). Rats were treated with  $\beta$  estradiol (E2, 10  $\mu$ g/kg of body weight – b.w.) or vehicle (VEH, sunflower oil, 0.1 ml) for 8 days. Angiotensin II (ANG II, 50 ng/1  $\mu$ l) or saline was administered into the LV (icv). E2 treatment reduced icv ANG II-induced water intake (3.7 ± 0.5, vs. VEH: 6 ± 0.5 ml/100 g b.w.) and pressor response (22 ± 7, vs. VEH: 37 ± 4 mmHg), with no effects on 0.3 M NaCl intake (0.7 ± 0.2, vs. VEH: 2 ± 0.6 ml/100 g b.w.) or heart rate. Quantitative real-time PCR analysis (qPCR) from other group of rats showed that the relative hypothalamic mRNA expression of AT1 angiotensinergic receptor (Agtr1a) was reduced in E2-treated OVX female SHRs (0.82 ± 0.16, vs. VEH: 1 ± 0.11). There was no effect on relative mRNA expression of hypothalamic Agtr2, ACE and ACE2. The results suggest that the reduction of hypothalamic Agtr1a mRNA relative expression might be a reason for the reduction in ANG II-induced pressor and dipsogenic responses in female SHRs treated with E2.

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Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **PULMONARY VENTILATION DIDACTIC PROTOTYPES SIMULATE INTERCOSTAL RETRACTIONS AND THE PARADOXICAL RESPIRATORY MOVEMENT INDUCED BY SUBATMOSPHERIC PRESSURE**

**Introduction:** Intercostal and subcostal retractions and paradoxical breathing movements are observed in respiratory muscle fatigue, airway obstruction and flail chest when subatmospheric pressure results paradoxically in chest depression or inter/subcostal retraction during the inspiratory phase. The biophysical principles which explain these phenomena are complex and require ion. Lung ventilation prototypes have been used as didactic tools to explain the biomechanical fundamentals of lung ventilation. **Objective:** To development two didactic prototypes of pulmonary ventilation to simulate intercostal retraction and paradoxical breathing movement induced by subatmospheric pressure. **Methods:** Two prototypes (P1 and P2) were built with syringes (60 ml), PET bottles (200 ml) and latex balloons to simulate lung ventilation. Openings of 4 x 1.5 cm were made on the lateral wall of the PETs, which were sealed with cutout latex, simulating the intercostal muscle. A stopper was used to simulate the paradoxical movement of the thorax during airway obstruction at P2. **Results:** At P1, the lowering of the plunger (diaphragm) induced a subatmospheric pressure inside the PET and resulted in the expansion of the ball concomitantly with the displacement of the latex to the interior of the PET (inter/subcostal retractions). At P2, the lowering of the plunger did not expand the latex ball due to the stopper obstruction, however, the displacement of the latex from the wall (thoracic paradoxical movement) was still observed. **Conclusion:** Prototypes with recyclable materials are low-cost tools which can be used didactically to explain complex clinical phenomena, such as intercostal and subcostal retractions, as well as paradoxical respiratory movements.

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*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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### **CONCURRENT EXERCISE DOES NOT PREVENT RECOGNITION MEMORY DEFICITS INDUCED BY BETA-AMYLOID IN RATS**

Alzheimer's disease (AD) is a common neurodegenerative disease, affecting brain areas involved in forming and storing memories. There is still no definitive treatment to reverse the cognitive deficits caused by AD, but some interventions can prevent and reduce its impacts. Here, we investigate the effects of concurrent exercise in preventing the object recognition (OR) memory deficits induced by A $\beta$  peptide infusion. We used two-month-old adult male Wistar rats ( $\cong$ 350g), according to the Institutional Animal Care and Use Committee (031/2018) approbation. The rats were divided into groups (n = 16/group): control (no physical exercise), running, strength exercise, or concurrent exercise (running + strength exercise, half of each modality volume). The exercise was conducted 3 times a week for 8 weeks. After, rats were submitted to stereotaxic surgery to inject saline or A $\beta$  peptide in the CA1 hippocampus area. After surgery recovery,  $\beta$ -amyloid aggregation and plaque formation, memory and biochemical

tests were performed. Data were analyzed by two-way ANOVA ( $P < 0.05$  was considered significant). A $\beta$  injection promoted OR memory deficits ( $P = 0.0366$  vs. saline), and the concurrent exercise cannot prevent them ( $P = 0.9999$  vs. A $\beta$ ). Running was the only exercise that prevented the A $\beta$  memory deficits ( $P = 0.0377$  vs. A $\beta$ ). A $\beta$  increased lipid peroxidation ( $P = 0.0002$  vs. saline) and running, strength and concurrent exercises prevented this increase in A $\beta$  rats ( $P = 0.0129$ ;  $P = 0.0043$ ;  $P = 0.0240$  vs. A $\beta$ ). A $\beta$  reduced the antioxidant capacity levels ( $P = 0.0003$  vs. saline), while strength exercise prevented this reduction ( $P = 0.0009$  vs. A $\beta$ ). The concurrent exercise increased reactive oxygen species levels in A $\beta$  rats ( $P = 0.0477$  vs. A $\beta$ ). In summary, concurrent exercise was ineffective in preventing memory deficits and biochemical dysfunctions in the A $\beta$  rats, while running and strength acted by different biochemical pathways to induce A $\beta$  protection.

ID: 4911

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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### **MATERNAL SWIMMING TRAINING BLOCKS LONG-TERM GLUCOSE INTOLERANCE IN RAT-OFFSPRING FROM OBESE MOTHERS**

While gestational obesity is a risk factor for metabolic disorders in the offspring, physical exercise is an important non-pharmacological tool to prevent it. We aimed to evaluate the effect of maternal swimming protocol throughout pregnancy and lactation on body composition and glucose homeostasis in rat-offspring from obese mothers. At 40-days-old, female Wistar rats were fed an obesogenic (high fat, 4.6kcal plus sucrose solution, 20%) or a normal-fat diet (Ob and Co groups). Three weeks later, a half of these mothers started to swim (Ob-Exe and Co-Exe groups). At 75-days-old, they were mated. At birth, body weight and naso-anus length of rat-offspring were recorded and body weight assessed every two days from weaning to adulthood, when rats underwent an intraperitoneal glucose tolerance test (ipGTT). At euthanasia tissues were collected to assess the adiposity and lean mass indexes. All protocols were approved by the Ethics Committee (218.017073/2019-56) and data analyzed statistically using 2-way ANOVA. In relation to Co-Sed rats, all the groups were smaller at birth ( $P < 0.05$ ). In adulthood, fasting glycemia was 16% higher in Ob-Sed than Co-Sed rats ( $P < 0.05$ ), while Ob-Exe rats displayed glycemia 9% smaller than Ob-Sed ( $P < 0.05$ ) that is similar to Co-Sed and Co-Exe rats. Adiposity index was 38% higher in Ob-Sed than in Co-Sed rats ( $P < 0.01$ ) and reduced by 14% in Ob-Exe compared to Ob-Sed rats ( $P < 0.05$ ), there were no significant difference between Ob-Exe and Co-Sed or Co-Exe rats. Regarding lean mass index, it did not change in experimental groups. The area under the curve values of glycemia during ipGTT were 15% higher in Ob-Sed compared to Co-Sed rats ( $P < 0.01$ ). In turn, this parameter in Ob-Exe was reduced by 6% compared to Ob-Sed rats ( $P < 0.05$ ), and similar to Co-Sed and Co-Exe rats. Our data show that gestational obesity induces low birth weight and long-term hyperglycemia, which can be mitigate by maternal swimming training during pregnancy and lactation.

ID: 4921

Área: *Ensino e Divulgação Científica*

*Forma de Apresentação: Ê-POSTER*

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## **SIMULATION OF RESPIRATORY RATE CONTROL BY AN ELECTRONIC MICROCONTROLLER**

Introduction: Physiological principles of respiratory rate (RR) control by the respiratory center (RC) can be explained, by analogy, using an electronic microcontroller. Aim: To use the Arduino to simulate the role of the RC in controlling the nerve impulses that control RR. Methods: The study was carried out at the Federal University of Juiz de Fora, Brazil. An Arduino/UNOR3 was used to simulate the cyclic execution of RR control commands through the 'loop' function. Programming structures (PROGS) in 'for' function were used to control inspiration and inhibition of the inspiratory phase (InspP) and to simulate the forced expiratory phase (ExpP). The 'for' command was used to analyze the positioning of the mechanical system and trigger the 's.write' command to simulate the motor neuron impulse. A constant output voltage was maintained and we configured interruptions in the signal supply at 10 ms intervals through the 'delay' function to simulate a RR of 16 breaths per minute. We tested the simulation of the electronic microcontroller as a control RC in a lung ventilation test system constructed from recyclable materials. Results: Consecutive and alternating interruptions in the supply of the electrical signal allowed to simulate the RR and observe the signals that initiate the InspP and ExpP independently. The loop reading of the PROGS simulated the RR cycle. The 'for' command allowed us to make an analogy with the Hering-Breuer reflex. One of the PROGS simulated the stimulus for inspiration controlled by the apneustic center and the other simulated the action of the pneumotaxic center by inhibiting InspP. Conclusion: Arduino had the potential to simulate the action of the nervous system on respiratory control, especially the RR and the action of pulmonary mechanoreceptors.

*ID: 4955*

*Área: Fisiologia de Órgãos e Sistemas: Digestória*

*Forma de Apresentação: Ê-POSTER*

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## **ACTION OF GLUTAMINE ON CELL DEATH PARAMETERS IN EXPERIMENTAL SEVERE ACUTE LIVER FAILURE**

Severe Acute Liver Failure (SAI) is characterized by loss of liver function due to disorders including cell death. Glutamine (Gln) is a fundamental amino acid that plays a protective role in a variety of cell injuries. The aim was to evaluate the effects of glutamine on cellular changes in experimental IHAG. We used 28 male Wistar rats, aged 8 weeks, weighing  $\pm$  250g, divided into groups CO, G, TAA, TAA+G. Two doses of thioacetamide were administered (400mg/kg ip). Three doses of Gln (25mg/kg ip) were administered. After 48 hours the animals were killed. Blood was collected for assessment of AST and ALT (U/L). The liver was collected for protein analysis by Western Blot (relative ratio) and histological evaluation (HE). Statistical analysis: ANOVA+Student-Newman-Keuls, significant when  $p < 0.05$ . CEUA/HCPA approved project: 15-0175. Gln reduced AST and ALT levels in animals in the

TAA+G group ( $334.48 \pm 39.12$ ;  $129.84 \pm 29.38$ ) compared to animals in the TAA group ( $619.24 \pm 99.10$ ;  $335.37 \pm 42.38$ ) ( $p < 0.01$ ). The expression of PI3K increased in the TAA+G group ( $2.05 \pm 0.2$ ) compared to the TAA group ( $1.21 \pm 0.29$ ) ( $p < 0.05$ ). Akt and FOXO3a proteins decreased in the TAA+G group ( $2.28 \pm 0.28$ ;  $2.35 \pm 0.29$ ) compared to the TAA group ( $3.19 \pm 0.52$ ;  $3.45 \pm 0.51$ ) ( $p < 0.001$ ). Bcl-2 increased in the TAA+G group ( $3.99 \pm 0.49$ ) compared to the TAA group ( $1.60 \pm 0.19$ ) ( $p < 0.001$ ). Bax and Caspase 3 reduced their expression in the TAA+G group ( $3.69 \pm 0.21$ ;  $2.20 \pm 0.51$ ) compared to the TAA group ( $4.61 \pm 0.40$ ;  $4.78 \pm 0.63$ ) ( $p < 0.05$ ). The mTOR, Beclin1 and LC3 $\alpha/\beta$  proteins decreased in the TAA+G group ( $2.65 \pm 0.32$ ;  $2.63 \pm 0.25$ ;  $2.36 \pm 0.19$ ) compared to the TAA group ( $4.63 \pm 0.69$ ;  $3.50 \pm 0.19$ ;  $3.69 \pm 0.45$ ) ( $p < 0.05$ ). In the histopathological evaluation, Gln promoted a restructuring of the hepatic parenchyma, reducing the inflammatory infiltrate, ballooning and necrosis. There was no statistical difference between the control groups. The results showed that Gln reversed the damage liver contributing to cell survival in this experimental model.

ID: 4968

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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## EFFECTS OF POSTNATAL EARLY OVERFEEDING ON VASCULAR FUNCTION OF FEMALE RATS

Childhood obesity is a serious problem in the world, putting children and adolescents at risk for poor health. In animal models, postnatal early overfeeding, induced by reduced litter, has helped to mimic childhood obesity. However, the vascular consequence of childhood obesity in female rats has not been evaluated. The study aimed to evaluate the effects of postnatal overfeeding on aortic reactivity in prepubertal and adult female rats. Thus, at one day of life, litters of Wistar rats were distributed into normal litter (mothers kept with 5 female and 5 male pups - NL) or small litter (mothers kept with 2 male and 1 female pups - SL). At PND 30 and PND 120, the female offspring were evaluated for body weight (g); food consumption (g); retroperitoneal, and perigonadal adipose tissue (fat pad weight/100g of the body  $n=9-13$ ) and in vitro thoracic aorta reactivity to phenylephrine (Pheny) in the presence or absence of endothelium, and vasodilation to acetylcholine (ACh), and sodium nitroprusside (SNP). The comparison of aortic study was made using the maximum response (maxR, g or %relaxation) for agonist ( $n=7-9$ ). Data were expressed as mean  $\pm$  M.S.E [CEUA 112/2020]. It was observed that food consumption between NL and SL groups was similar at both ages. At PND 30, SL had a higher body weight [NL  $76.56 \pm 2.12$  vs SL  $91.52 \pm 1.78$ ], retroperitoneal [NL  $0.09 \pm 0.01$  vs SL  $0.17 \pm 0.01$ ] and perigonadal [NL  $0.04 \pm 0.005$  vs SL  $0.09 \pm 0.009$ ] adipose than NL. At PND 120, NL and SL have similar biometric parameters. At PND 30 and PND 120, maxR to Phenyl was similar between groups. The maxR to ACh of SL in PND 30 [NL  $99.65 \pm 2.5$  vs SL  $90.92 \pm 2.4$ ] and PND 120 [NL  $94.05 \pm 1.5$  vs SL  $84.65 \pm 2.5$ ] were decreased when compared with NL. MaxR to SNP were similar in both ages. Postnatal overfeeding induced by small litter caused obesity during childhood, but it was not present in the adulthood. However, the endothelial dysfunction caused by childhood obesity was permanent in female rats.

ID: 4997

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **RESPIRATORY IMPAIRMENT IN 6-OHDA MODEL OF PARKINSON'S DISEASE DEPENDS ON TUMOR NECROSIS FACTOR ALPHA RECEPTOR 1**

Respiratory deficits are responsible for considerable deaths in Parkinson's Disease patients. Respiratory impairment in a rat model of PD induced by 6-hydroxydopamine (6-OHDA) injection in caudate-putamen (CPu) is probably linked to brainstem degeneration. Many mechanisms are responsible for neuronal death, including neuroinflammation. This study aims to investigate the role of inflammation mediated by glial cells in respiratory functional and neuroanatomical deficits in an animal model of PD induced by 6-OHDA. 3-6 months old male C57BL/6 or tumor necrosis factor receptor 1 knockout mice weighting 20-25g (TNFR1<sup>-/-</sup>) (CEUA:8760150318) were anesthetized with isoflurane 2.5% and received bilateral injection of 6-OHDA (10µg/µl) or vehicle in CPu through stereotaxic surgery. 20 days after surgery, mice were submitted to whole body plethysmography under normal and hypercapnic conditions (7%CO<sub>2</sub>). Perfused brains were removed to anatomical analysis. 6-OHDA destroyed TH<sup>+</sup> neurons in Substantia nigra (SNc) in all groups analyzed (6-OHDA WT:77%; 6-OHDA TNFR1<sup>-/-</sup>:79%). Degeneration was observed in preBötzing complex (preBötC) and in retrotrapezoid nucleus (RTN) in 6-OHDA WT group, but not in 6-OHDA TNFR1<sup>-/-</sup> group (preBötC:6-OHDA WT:43%, 6-OHDA TNFR1<sup>-/-</sup>:22%; RTN:6-OHDA WT:52%;6-OHDA TNFR1<sup>-/-</sup>:15%). Astrocyte's density in SNc is enhanced in 6-OHDA WT group but not in 6-OHDA TNFR1<sup>-/-</sup> group (6-OHDA WT:122%) and is reduced in preBötC in all groups analyzed (p<0.05). In RTN, no change was observed. Microglia analysis indicates neuroinflammation in SNc and RTN in all groups. Respiratory assessment reveals reduction in basal respiratory rate in 6-OHDA WT group but not in 6-OHDA TNFR1<sup>-/-</sup> group (6-OHDA WT:25%; 6-OHDA TNFR1<sup>-/-</sup>:17%). No change was observed between groups in respiratory parameters under hypercapnia. Inhibiting TNF-α inflammation pathway, reduction in respiratory rate and neurodegeneration is prevented indicating the involvement of this pathway in the respiratory changes in this model.

ID: 5008

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### **ADMINISTRATION OF PROBIOTIC LIMOSILACTOBACILLUS FERMENTUM STRAINS REDUCE BLOOD PRESSURE AND ALLEVIATE RENAL DYSFUNCTION AND OXIDATIVE STRESS IN MALE OFFSPRING FROM DAMS FED A HIGH-FAT DIET**

This study evaluated the effects of a formulation containing *Limosilactobacillus (L) fermentum* 139, 263 and 269 on blood pressure (BP), renal function and oxidative stress in male offspring from dams fed a high-fat diet during pregnancy and lactation. Wistar female were fed a control (CTL, n=5) or high-fat (HF, n=5) diet during pregnancy and lactation. After weaning, offspring from CTL and HF dams were

fed with a standard laboratory diet. At 100 days of age, male offspring were allocated in three groups: CTL(n=5) and HF(n=5) receiving placebo (PBS solution) and HF receiving a probiotic formulation containing *L. fermentum* at a dose  $3 \times 10^9$  CFU (HF+Lf, n=5), for four-week. After the intervention period, were evaluated BP, creatinine clearance (CCr) and renal biomarkers for oxidative stress, to cite: malondialdehyde (MDA), thiols content and enzymatic activities of superoxide dismutase-SOD, catalase-CAT and glutathione-S-transferase-GST. CEUA/UFPB approval: N° 4517240418. HF group had increased mean arterial pressure (MAP) when compared to CTL group ( $98 \pm 3.8$  vs.  $89 \pm 5.5$  mmHg,  $p=0.034$ ). *L. fermentum* administration reduced MAP in HF group when compared to their HF placebo ( $87 \pm 3.4$  vs.  $97 \pm 1.9$  mmHg,  $p=0.015$ ). In kidney, male offspring from HF dams had increased MDA levels ( $0.25 \pm 0.08$  vs.  $0.12 \pm 0.05$  nmol/mg protein,  $p=0.023$ ) and reduced SOD ( $309 \pm 38$  vs.  $399 \pm 58$  U/mg protein,  $p=0.051$ ) and CAT activities ( $7.7 \pm 2.7$  vs.  $18.2 \pm 2.9$  U/mg protein,  $p=0.003$ ) when compared to CTL group. In comparison to HF group, administration of *L. fermentum* increased CAT activity ( $15.2 \pm 2.1$  vs.  $7.7 \pm 2.7$  U/mg protein,  $p=0.005$ ) and tended to increase SOD activity ( $406 \pm 75$  vs.  $309 \pm 38$  U/mg protein,  $p=0.055$ ). There was a reduction in CCr in HF group compared to CTL group ( $25 \pm 5.4$  vs.  $96.4 \pm 16$  mL/min,  $p=0.048$ ), and administration of *L. fermentum* formulation restored CCr ( $103 \pm 27$  vs.  $25 \pm 5.4$  mL/min,  $p=0.04$ ). In conclusion, *L. fermentum* reduced blood pressure, improved antioxidant capacity and kidney function in the male offspring from dams fed with a HF diet.

ID: 5014

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **DIDACTIC PROTOTYPE MAY BE USEFUL TO EXPLAIN THE FUNDAMENTAL BIOPHYSICAL PHENOMENA OF THE RELATIONSHIP BETWEEN INTRACRANIAL PRESSURE AND VASCULAR PERFUSION PRESSURE**

Introduction: Cerebral perfusion pressure (CPP) results from the difference between mean arterial pressure and intracranial pressure (ICP). The comprehension of the biophysical principles that explain how ICP influences CPP dynamics requires ion and can be explained by analogy using low-cost prototypes. Objectives: To develop a didactic prototype with recyclable materials that shows the influence of ICP on CPP. Methods: A prototype was built with a PET bottle (200ml), overpassed by a latex ball (5:150 cm), simulating, respectively, the skull and a single cerebral vessel. A syringe (10ml) was connected to the PET to reduce the volume of the system and increase the pressure inside it. A latex bulb, containing a unidirectional valve, was connected to the latex ball through a double-lumen tube, in which one of the branches was used to direct an airflow to the latex ball. To demonstrate the pressure variation inside the PET ( $\Delta P1$ ) and inside the latex ball ( $\Delta P2$ ), two aneroid manometers (M1 and M2, respectively), connected with latex hoses, were used. All connections have been properly sealed with silicone. Results: Compression of the syringe plunger reduced the volume of the system and increased  $\Delta P1$ , resulting a collapse in the ball and increased resistance to the passage of air flow (with an increase in  $\Delta P2$  in M2) when the bulb was pressed. The perceived handgrip effort to compress the bulb was higher when  $\Delta P1$  was increased. The prototype allowed a direct intuitive comparison between the PET/skull and the ball/blood vessel, as well as it was possible to see how the elevation of the ICP plays an important role in the CPP. Conclusion: Prototypes with low-cost materials are intuitive and

easily accessible tools that can be used to didactically illustrate the fundamental biophysical influence of ICP on CPP in humans.

ID: 5018

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **MUSCARINIC RECEPTORS IN THE MEDIAL SEPTAL AREA INVOLVED IN THE SALIVATION AND WATER INTAKE INDUCED BY PILOCARPINE INJECTED INTRAPERITONEALLY**

Patients with low salivary secretion present signs of oral burns, oral mucosa infection, feeding difficulties and periodontal diseases. Pilocarpine (non-specific muscarinic agonist) induces salivation acting in salivary glands and also activating central mechanisms that stimulate salivation. In addition, pilocarpine injected intraperitoneally (ip) also induces water intake. In the present study, we investigated the involvement of different muscarinic receptor subtypes in the medial septal area (MSA) in the salivation and water intake induced by pilocarpine injected ip. Adult male Holtzman rats (250-350 g) with stainless steel cannulas previously implanted in the MSA were used (Proc. CEUA FOAr 07/2018). Salivary secretion was measured in rats anesthetized with ketamine, using cotton balls previously weighed and placed in the oral cavity for 7 minutes. Water intake was measured for 1 hour using graduated tubes. Pilocarpine (1 mg/kg body weight) was injected ip 15 min after injection of pirenzepine (M1 antagonist, 50 nmol) or 4-DAMP (M1/M3 antagonist, 50 nmol), methoctramine (M2/M4 antagonist, 50 nmol), tropicamide (M4 antagonist, 50 nmol) or vehicle into the MSA. Pilocarpine injected ip induced water intake ( $2 \pm 0.4$  ml/60 min) and intense salivation ( $463 \pm 35$  mg/7 min) in rats treated with vehicle into the MSA. Salivation induced by ip pilocarpine was reduced ( $313 \pm 50$  mg/7 min) by the previous injection of 4-DAMP into the MSA, not by the other muscarinic antagonists injected into the MSA. Water intake induced by ip pilocarpine was abolished ( $0.4 \pm 0.2$  ml/60 min) by the previous injection of metoctramine into the MSA, not by the injection of the other muscarinic antagonist into the MSA. The results suggest that M3 receptors in the MSA are involved in the salivation induced by ip pilocarpine, whereas the dipsogenic response to ip pilocarpine depends on M2 receptor activation in the MSA.

ID: 5029

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### **EFFECTS OF CAMPSINDRA LAURIFOLIA IN AN EXPERIMENTAL MODEL OF COLITIS IN RATS**

Ulcerative colitis (UC) affects the mucosa and submucosa of the large bowel. The excessive

production of reactive oxygen species (ROS) is directly involved in the inflammatory process of UC. The aqueous extract of *Campsiandra laurifolia*, also known as *Acapurana*, has a high content of phenolic compounds and total tannins, in addition to high antioxidant potential, being a possible therapeutic agent in UC, as these substances can reduce the production of ROS. The objective of this study is to evaluate the effects of *Campsiandra laurifolia* in an experimental model of acetic acid induced colitis. Study approved FIPE/HCPA: 2019-0196. Thirty-six male Wistar rats aged 60 days and 350g were used, divided in: CO, CO+A25 (25 mg/kg), CO+A50 (50 mg/kg), CL, CL+A25 (25 mg/kg) and CL+A50 (50 mg/kg). Colitis was induced by enema with 4 ml of 4% acetic acid. *Acapurana* extract was administered by gavage for two days, according to the established dose. On the 4th day of the experiment, sphincter anal pressure (SAP) was measured, and the animals were euthanized. Intestinal tissue was collected for assessment of lipoperoxidation (LPO) and GSH levels, and histological analysis. Statistical analysis was ANOVA+Student Newman Keuls (mean±SD) significant when  $p < 0.05$ . The SAP (cmH<sub>2</sub>O) of the CL+A25 (21.6±1.49) and CL+A50 (26.4±1.46) groups increased significantly when compared to the CL group (14.6±1.06). In the LPO evaluation by TBARS (nmoles/mg prot) there was a significant reduction in groups CL+A25 (0.52±0.097) and CL+A50 (0.41±0.060) compared to the CL group (0.80±0.093). Histologically, groups CL+A25 and CL+A50 showed regeneration of the crypts, reduction of hemorrhage and inflammatory infiltrate compared to the CL group, like controls. Control groups there was no significant difference. The administration of *Acapurana* extract increased anal sphincter pressure, decreased lipoperoxidation, restored GSH levels, reduced tissue damage and the inflammatory process.

ID: 5031

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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#### THE EFFECT OF ROTENONE ON MITOCHONDRIAL DYSFUNCTION AND NEURONAL DEATH IN ASCIDIA STYELA PLICATA

Chronic exposure to rotenone induces selective degeneration of Nigralstriatal dopaminergic neurons and reproduces characteristics of Parkinsonism in experimental animals. This action may be related to the inhibition of mitochondrial complex I, which has been associated with the development of mitochondrial dysfunction, such as decreased ATP production. This study was carried out to evaluate the effects of rotenone exposure on mitochondrial dysfunction and central nervous system (CNS) degeneration of ascidians *Styela plicata*. Thus, histological analyzes were performed using HE staining and immunofluorescence for antibodies: BIII-tubulin, Caspase-3 and Dopa-Decarboxylase. In addition, were performed: molecular analyzes through real-time PCR for: Caspase-3, ATP-synthase and Ubiquitin (UBQ) and a biochemical analysis of the ATP synthase hydrolysis activity. Finally, the ascidian siphon stimulation test was carried out to assess the behavior of the animal against exposure to rotenone. With the results, it was possible to observe an increase in the presence of vacuolization in the cytoplasm of neurons and disorganization of the cortex. Furthermore, immunohistochemical analyzes showed that there was a decrease in the number/area of young neurons in the CNS, besides to an increase in caspase-3 labeling, showing that rotenone may be inducing cell death by apoptosis. Moreover, it was possible to observe that there was a decrease in dopamine production, which can be reversed with the injection of the drug 3,4-dihydroxy-1-phenylalanine (L-dopa), recovering also, the time of closure of the ascidian siphon. Finally, it was seen that genes such as ATP synthase, Caspase-3 and UBQ had their expression increased after 12 hours of treatment, suggesting that rotenone may be interfering

with the mechanism of production of ATP via ATP synthase, besides to interfering with the mechanism reverse hydrolysis of this molecule. Therefore, it is suggested that rotenone is related to contributing to neurodegeneration through the impairment of mechanisms related to energy production.

*ID: 5033*

*Área: Ensino e Divulgação Científica*

*Forma de Apresentação: Ê-POSTER*

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### **THE USE OF SOCIAL NETWORKS IN SCIENCE DISSEMINATION AS A WAY TO COMBAT NEUROMYTHS**

There is growing interest in applying neuroscience findings to integrate educational theory, practice, and policy. The brain is a plastic organ - malleable in response to environmental stimuli - and educators play an essential role in sculpting its structure and function through instruction. Thus, challenged by the COVID-19 pandemic, which has imposed on society a new way to carry out its daily activities, we propose to use social networks to disseminate quality scientific knowledge easily accessible to the most diverse types of audiences, including educators. Here, we report the impact of the scientific disclosure performed by *Instagram* profile @programapopneuro. Since July 2020, we have addressed issues of neuroscience applied to education and neuromyths in the project's *Instagram* profile. Every day, we posted explanatory cards created on the *Canva* platform based on scientific evidence. The statistics provided by *Instagram* measured the impact of the actions. The *Instagram* account has 2828 followers (growing) and, in July, shows an interaction increase of 29% compared to June. The publications with the highest number of interactions are related to neuromyths - misconceptions about the brain and how people learn, such as the idea that we use 10% of our brain or that we learn better when considering our learning style. These publications reached 2526 average accounts, 81% of which are non-followers. This interaction may result from the search to understand how the brain works, relating it to everyday events. Considering that some neuromyths are ingrained in society in general, there is a tendency for education professionals to believe in the veracity of this information, jeopardizing the teaching-learning process. Thus, we stress the importance of producing and disseminating quality evidence-based content in an accessible way, contributing to the development of critical thinking and understanding of the processes related to learning and memory.

*ID: 5034*

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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## ESTRADIOL AND OREXINERGIC NEURONS: IMPLICATIONS FOR PANIC DISORDER

Panic disorder (PD) is an anxiety disorder that affects ~5% of the population. A significant group of PD patients are characterised by excessive behavioral and physiological responses to CO<sub>2</sub> inhalation. The prevalence of PD is 2 to 3 times more frequent in women yet, the origins of this sexual dimorphism are unknown; the fact that excessive responsiveness to CO<sub>2</sub> inhalation peaks during the premenstrual phase suggest a role of ovarian hormones. Early life stress is a significant risk factor for PD and there is growing evidence indicating that stress-related increase in the function of orexin-producing neurons (ORX) is key to PD. Here, we investigated if neonatal maternal separation (NMS) 1) disrupts hormonal regulation of the ventilatory response to CO<sub>2</sub> in female rats and 2) attenuates the inhibitory actions of 17-β estradiol (E2) on orexin neurons (ORX). Rat pups were exposed to NMS (3 h/day; postnatal day 3–12). The ventilatory response to CO<sub>2</sub>-inhalation was tested before puberty, across the estrus cycle, and following ovariectomy using whole-body plethysmography. Plasma E2 and hypothalamic ORXA were measured. The effect of an ORX1 antagonist (SB334867; 15 mg/kg) on the CO<sub>2</sub> ventilatory response was tested. Excitatory postsynaptic currents (EPSCs) were recorded from ORX neurons using wholecell patch-clamp. Our results showed that NMS-related increase in the CO<sub>2</sub> response was observed only when ovaries were functional; the largest ventilation was observed during proestrus and SB334867 blocked this effect. NMS augmented levels of ORXA in hypothalamus extracts. EPSC frequency varied according to basal plasma E2 levels across the estrus cycle in controls but not NMS. We conclude that NMS reproduces developmental and cyclic changes of respiratory manifestations of PD. NMS disrupts the inhibitory actions of E2 on the respiratory network. Impaired E2-related inhibition of ORX neurons during proestrus is a novel mechanism in respiratory manifestations of PD in females.

ID: 5044

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## FOXO IS NOT REQUIRED FOR HEPATIC GLUCONEOGENESIS ACTIVATION BY SYMPATHETIC INNERVATION IN MICE UNDER COLD STRESS

Although it is well established CREB (cAMP responsive element-binding protein) and FoxO1 (Forkhead box O1) are the main transcriptional factors of gluconeogenesis. However, the role of noradrenergic fibers in these factors' modulation and its physiological effects on gluconeogenesis is still unknown. Previously, we found that CREB and its co-activator 2 (CRTC2) is necessary for gluconeogenic genes activation in mice under cold stress by hepatic sympathetic innervation. Therefore, we aimed to investigate if FoxO is also involved in this response. The architecture of hepatic noradrenergic innervation in male mice (C57Bl6J; CEUA nº183/2015) was investigated by the 3DISCO (3D imaging of solvent-cleared organs) technique. We found sympathetic nerves do not make direct contact with hepatocytes and are restricted to the vasculature. Neonate mice were sympathectomized (6-OH-Dopamine) and 8-10 weeks later were exposed to cold (4°C) for 3-6h and the liver was harvest for enzymatic activity, western blot, and Rt-PCR analysis. Data were expressed as means ± SEM (p<0.05). In innervated mice, cold exposure (6h) increased plasma levels of glucose, corticosterone and glucagon but suppressed insulinemia. Cold also increased activity and mRNA levels of PEPCK and G6Pase in the liver. These effects were associated with a decrease of AKT signaling and an increase in the levels

of hepatic norepinephrine, Ser133CREB phosphorylation, FoxO1 deacetylation, FoxO1/3 and CRT2 dephosphorylation. Sympathectomy abolished the activation of CREB/CRT2 but did not interfere with FoxO status. Moreover, AMPc and Ca<sup>2+</sup> pathways were stimulated during the acute cold stress and the sympathectomy selectively modulated the Ca<sup>2+</sup> signaling. Data indicate CREB/CRT2 are recruited by noradrenergic fibers in response to cold, probably by Ca<sup>2+</sup>-dependent signaling, without FoxO participation, leading to gluconeogenic gene transcription and glucose production.

ID: 5045

Área: *Fisiologia de Órgãos e Sistemas: Renal*

Forma de Apresentação: *Ê-POSTER*

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#### IMMUNOHISTOCHEMICAL ANALYSIS OF SODIUM TRANSPORTERS IN KIDNEYS OF OFFSPRING OF RATS SUBJECTED TO HIGH FRUCTOSE CONSUMPTION DURING PREGNANCY AND LACTATION

The consumption of foods containing fructose is part of daily diet, however, during pregnancy, the excessive consumption of this sugar can alter the maternal environment, predisposing the offspring to hypertension and renal dysfunction. Aims: to evaluate the effects of fructose overload during pregnancy and lactation on the expression of sodium transporters in kidneys of the male offspring at adulthood. Female Wistar rats were randomly distributed into groups: Control (C) and Fructose (F). C received food and water ad libitum, and F received food and D-fructose solution (20%) to drink ad libitum. The offer of D-fructose to F started 1 week before mating and continued during pregnancy and lactation. After birth, the progeny were designated as Control (C) and Fructose (F). After half of C offspring was assigned to drink water (CW) and the other half was given D-fructose (CF). In the same way half of F offspring were assigned to drink water (FW) and the other half to drink D-fructose (FF). The experimental groups were: 1: CW, 2: CF, 3: FW and 4: FF. The expressions of the transporters: NHE3-exchanger, NKCC and NCC-cotransporters, and ENaC channel were evaluated at 4 months of age. CEUA: 2757270117. Results shown as mean±SEM, \* ≠ C/A, p≤0.05 (ANOVA). The F/F group showed increased expression of NHE3, NCC and ENaC-beta. All sodium transporters were increased in F/A [(NHE3: C/A:3.95±0.40; C/F:4.65±0.37; F/A:6.98±0.13\*; F/F:5.53±0.33\*), (NKCC; C/A:1.23±0.05; C/F:1.45±0.10; F/A:3.15±0.47\*; F/F:1.84±0.40), (NCC; C/A:0.32±0.10; C/F:0.66±0.10; F/A:1.0±0.16\*; F/F:0.84±0.11\*), (ENaCalfa; C/A:0.81±0.18; C/F:1.49±0.11; F/A:1.92±0.13\*; F/F:1.73±0.37), (ENaCbeta; C/A:1.03±0.05; C/F:1.21±0.05; F/A:1.58±0.03\*; F/F:1.35±0.10\*) % area/field]. These data show that increased consumption of fructose during pregnancy and lactation resulted in increased expression of the renal sodium transporters predisposing the male offspring to hypertension and renal dysfunction.

ID: 5046

Área: *Fisiologia de Órgãos e Sistemas: Digestória*

Forma de Apresentação: *Ê-POSTER*

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**EVALUATION OF 5 $\alpha$ -DIHYDROTESTOSTERONE IN THE MODULATION  
OF THE IMMUNE RESPONSE IN MACROPHAGES INDUCED  
BY *STAPHYLOCOCCUS AUREUS***

*Staphylococcus aureus* infections have a high morbidity and mortality rate, considered a major problem for public health. There is little information on the role of dihydrotestosterone in infections caused by *S. aureus*. The objective was to evaluate the influence of 5 $\alpha$ -Dihydrotestosterone (DHT) on the murine peritoneal macrophage response (MPMs) in the immunological response induced by *S. aureus*. After approval by the Ethics Committee on the Use of Animals (CEUA) under protocol number 059/2018, an *in vitro* model was performed from 9 BALB/C mice aged six weeks with 16 grams: male Shams, orchietomized (OQX) and female MPMs. The cells were inoculated with 10  $\mu$ l of *S. aureus* capa 80 or with sterile saline (control) for a period of 6h. The cells of the male OQX, females were also pre-treated with the concentration of 100 $\mu$ l (10<sup>-2</sup> M) of DHT per 24h before stimulation with the bacterium. The Cytokines TNF- $\alpha$ , IL-1 $\alpha$ , IL-6, IL-8, IL-10, total nitrites, hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) were measured in culture supernatant in MPMs. In addition, Toll like 2 (TLR-2) and Kappa B Nuclear Factor (NF kB), genes involved in the immune response were analyzed. Our results showed that in MPMs, the cells inoculated with *S. aureus* of Sham males showed higher levels of inflammatory cytokines and lower concentrations of IL-10, total nitrites and H<sub>2</sub>O<sub>2</sub> compared to OQX. The cells of Sham males inoculated with *S. aureus* also showed higher concentrations of inflammatory cytokines and lower concentrations of IL-10, total nitrites and H<sub>2</sub>O<sub>2</sub> compared to females. In the treatment with DHT, the concentration of inflammatory cytokines and the expression of genes such as TLR-2 and NF-kB were higher in OQX treated with the hormone compared to OQX without the pretreatment. In addition, total nitrite and H<sub>2</sub>O<sub>2</sub> concentrations were lower in pre-treatment cells, both in OQX male cells and in females. It is suggested that DHT acts as an immunomodulatory in the macrophage response induced by *S. aureus*.

ID: 5047

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER - Prêmio Branca

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**EVALUATION OF THE ROLE OF 17 $\beta$ -ESTRADIOL ON THE MONOCYTE / MACROPHAGE  
IMMUNE RESPONSE INDUCED BY *Staphylococcus aureus***

Clinical and experimental evidence supports the hypothesis that sex steroids regulate the immune response and thus exert effects on adverse pathological conditions such as bacterial infections. In general, the hormonal influence paradigm on the immune response stipulates that estrogen increases this response, while testosterone suppresses it. However, data in the literature are still controversial. Still, there is a gap regarding the role of estrogen in infections with Gram-positive bacteria such as *S. aureus*. The aim of this study was to evaluate the influence of 17 $\beta$ -estradiol on *S. aureus*-induced immune response in an *in vitro* model of human peripheral blood monocytes (hPMs). The study was developed after approval by the Human Research Ethics Committee of the Federal University of Bahia, Multidisciplinary Institute for Health (CAAE: 51919515.5.0000.5556). For this, six men and six women were selected and hPMs were isolated from peripheral blood samples of the volunteers, age between 18 and 25 years old. In women, blood was collected in both menstrual and fertile periods. After 24h in a CO<sub>2</sub> oven, the hPMs were inoculated by *S. aureus* for 6 hours. After this period, the supernatant was collected for Luminex cytokine analysis and the hPMs removed for analysis of 84 genes involved in

host response to bacterial infections by RT-PCR array. Previous treatment with E2 decreased the gene expression and production of proinflammatory cytokines, such as TNF- $\alpha$ , IL-1 $\beta$  and IL-6 and decreased the expression of TLR2. The analysis of gene expression shows that E2 inhibited the NF $\kappa$ B pathway. It is suggested that 17 $\beta$ -estradiol acts as an immunoprotective in the monocyte/macrophage response induced by *S. aureus*.

ID: 5048

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### **MATERNAL PERIODONTAL DISEASE PROMOTES IN THE OFFSPRING LOW BIRTH WEIGHT, CATCH-UP GROWTH AND, IN ADULTHOOD, CHANGES IN THE MICRORNA PROFILE IN MUSCLE**

Previous studies have demonstrated that maternal periodontal disease (PD) promotes: insulin resistance; increased plasma concentrations of cytokines; reduced GLUT4 expression; and was able to activate inflammatory pathways in the skeletal muscle of adult offspring. However, no changes in DNA methylation of the GLUT4 gene was observed in adult offspring. These findings evidenced the need for further studies to verify other mechanisms involved, such as miRNAs expression patterns in the adult offspring. The aims of the present study are to evaluate in adult rats, offspring of rats with PD: body weight; global expression of miRNAs in gastrocnemius skeletal muscle. Female Wistar rats (200g) were distributed into two groups: with PD-PED, induced by ligation with silk thread around the 1st molar, control rats-CN. Seven days after ligature placement, rats of both groups were mated. After weaning, male offspring were distributed into control offspring (CN-o) and PD offspring (PEDo) groups. Body weights were measured from 0–75 days of age. At day 75, analysis of the global expression of miRNAs was performed by microarray in total RNA extracted from muscle samples. There was a significantly lower birth weight in the PED-o group compared to the CN-o group. However, body weight did not differ at the weekly weighing, carried out until 75 days of age, between the CN-o and PED-o groups. We identified 11 miRNAs that were modulated in adult offspring of rats with PD when compared to control rats. Among these, 5 miRNAs were upregulated and 6 downregulated. Therefore, maternal PD is capable of promoting low birth weight, catch-up growth and, in adulthood, changes in microRNA profile in muscle. These findings reinforce the importance of caring for maternal oral health during pregnancy in order to avoid adverse pregnancy outcomes and epigenetic modifications in their adult offspring.

ID: 5049

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## MATERNAL TRUE ENDODONTIC-PERIODONTAL LESIONS PROMOTES LOW BIRTH WEIGHT AND ACTIVATION OF INFLAMMATORY PATHWAYS IN THE SKELETAL MUSCLE OF THEIR ADULT OFFSPRING

Studies have shown that both maternal periodontal disease (PD) and apical periodontitis (AP) in rats promote insulin resistance (IR) in their adult offspring because are associated with increased tumor necrosis factor-alpha (TNF-alpha) that can stimulate I $\kappa$ B kinase (IKK) and c-Jun N-terminal protein kinase (JNK), resulting in attenuation of the insulin signal. However, studies investigated the effects of maternal endodontic-periodontal lesions (EPL) on offspring health are scarce and, in these cases, the impact could be even more. The aims of this study were to evaluate in adult rats, offspring of rats with EPL: body weight; inflammatory pathway in the gastrocnemius muscle (GM). Therefore, Wistar female rats were distributed: control rats; rats with a AP; rats with an induced PD; rats with EPL. After 30 days of inducing oral inflammations, rats from all groups were placed for mating with healthy rats. After weaning, male offspring were distributed into control offspring-CN-o, AP offspring-AP-o; PD offspring-PED-o and EPL offspring-EPL-o groups. Body weights were measured from 0–75 days of age. When male completed 75 days, the experiments were performed: evaluation of body weight; TNF-a content in GM; JNK and IKK $\alpha$ /b phosphorylation status in GM by *Western blotting* method. The results showed that: maternal PD and EPL promote low birth weight (LBW) of their offspring; there was no LBW in the PPA group; no statistical differences were observed in body weight between all groups during the 75-day period; the PED-o and EPL-o groups showed an increase in the IKK $\alpha$ /b phosphorylation status compared to the CN-o and AP-o groups; AP-o, PED-o and EPL-o groups showed increased TNF- $\alpha$  content compared to the CN-o group. These findings reinforce the importance that the maintenance of good maternal oral health has on the general health of the offspring.

ID: 5053

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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## FUNCTIONAL ELECTRO-STIMULATION AND BLOOD FLOW RESTRICTION AS A TRAINING TO AVOID ATROPHY IN MUSCLES AFFECTED BY SPINAL CORD INJURY

Muscle atrophy is a serious complication of spinal cord injuries SCI that impact large muscle groups and can also lead to side effects, such as metabolic syndrome and diabetes. The combination of blood flow restriction exercise (BFR), proposed as an effective method to induce hypertrophy, with low training loads, was combined with low intensity functional electrostimulation (FES) in muscles affected by spinal cord injury. Nine participants in the FES + BFR group (right thigh+left thigh, N = 18) and 7 participants in the FES group (right thigh + left thigh, N = 14) with complete spinal cord injury (ASIA A), 24.5  $\pm$  15.5 years; 72.2  $\pm$  16.8 kg, 1.73  $\pm$  0.11m, were analyzed. The chronic responses with (FES + BFR) and without occlusion (FES) were performed in four identical sessions to measure muscle thickness and edema: 48 hours before the first training session (PRE); before the start of the 8<sup>th</sup> session (INT); 72 hours after the last session (POS) and three weeks after the end of the training sessions (DES). Both groups (FES + BFR and FES) performed 16 training sessions, two sessions per week. The sessions were two days apart, for 8 weeks. Ethics approval – CAAE NUMBER: 48571315.4.0000.5225 OPINION NUMBER:

1.474.654. The FES + BFR group showed a chronic increase in MT after 4 weeks of training ( $p < 0.05$ ), with no additional increases in MT from the 4<sup>th</sup> to the 8<sup>th</sup> week ( $p > 0.05$ ). After 3 weeks of detraining, MT decreased to baseline. No changes in MT were observed in the FES ( $p > 0.05$ ). TM induced by FES + BFR stimuli increases in the paralyzed skeletal muscles of SCI. The initial increases in MT can be attributed to edema, whereas after the 4<sup>th</sup> week, it is likely to be related to muscle hypertrophy.

ID: 5054

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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#### **THERAPEUTIC POTENTIAL OF EXTRACELLULAR VESICLES SECRETED BY MESENCHYMAL ADIPOSE TISSUE CELLS IN ACUTE KIDNEY INJURY INDUCED BY SEPSIS**

Sepsis is defined as a fatal organ dysfunction, caused by an unregulated host response to infection and affects millions of people around the world, leading to death one in four patients (RHODES et al., 2017). In view of the epidemiological data and the low efficacy of existing treatments, it is necessary to search for new therapies capable of reducing or preventing the progression of injuries. The aim of this study is to investigate the effects of the early administration of extracellular vesicles (EV) from adipose tissue mesenchymal stem cells (ADMSC) in animal model of sepsis induced acute kidney injury. This study was approved by the local committee for ethics in animal experimentation protocol number 074/19. Male Wistar rats at 12 weeks of age were used. In the Sham, surgery was performed, without ligation and cecal perforation; in the CLP 10P, sepsis was induced followed by administration of sterile saline i.v., 30 min after surgery; in the CLP 10P VE, sepsis was induced and the amount of EV obtained from 106 ADMSC was administered i.v., 30 min after the start of surgery. 72 h after the beginning of the experimental protocol, the animals were euthanized, blood, kidney and urine samples were collected. The ADMSC were isolated due to their adhesive properties to plastic and homogeneous in the expression of specific markers of mesenchymal cells with very low or negative expression for all hematopoietic and progenitor cell markers. EV had a heterogeneous size distribution with 100-700 nm in diameter. The CLP 10P VE presented an increase in survival 80%, compared to Sham 100% survival and CLP 10P 44.1% survival. The EV treatment improved the renal function by increasing the glomerular filtration rate and reducing renal tissue damage by the injury score. Thus, we can suggest that the use of EV had a beneficial effect on the renal function of rats submitted to sepsis by the CLP 10P model, when administered 30 min after the surgical procedure.

ID: 5055

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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## LYSYL OXIDASES IN THE PATHOPHYSIOLOGY OF BREAST CANCER: A BIOINFORMATICS APPROACH

Lysyl oxidase enzymes (LOX and LOXL 1-4) are copper-dependent amine oxidases that play a critical role in the physiology of the connective tissue matrices, by crosslinking the extracellular matrix (ECM) proteins, collagen and elastin. In the carcinogenesis process, such activity facilitates cell migration and the formation of metastases. Consequently, these enzymes, and LOXL2, have been suggested as potential druggable targets to prevent breast cancer (BC) metastasis. To fill this gap, a series of bioinformatic-based approaches was followed. The expression profile of LOXs and the impact of this expression on BC patient survival were assessed using the TCGA database. The correlation between the expression of the various LOXs, of those with other ECM-related genes and the breast tumor infiltrates was also assessed. Higher levels of LOXL1-3 are generally found in BC tissues when compared with normal tissues, while LOXL4 expression is decreased, particularly in higher stages. The overexpression of LOXL1 has a negative impact on disease free survival (DFS) in all BC subtypes, while LOXL2 negatively impacts the DFS of basal and HER2+ subtypes. The impact of LOXL3 on DFS is cancer subtype-dependent. The downregulation of LOXL4 is associated with a reduction of DFS and overall survival in HER2+ patients. The high expression of these enzymes is associated with increased CAFs in all subtypes. The expression of LOX and LOXL1-2 is linked with lower infiltration of B, T CD4+, and T CD8+ cells. A strong positive correlation was found between the expression of LOX and LOXL1-2 and the expression of ECM-related with seven genes. A correlation between expression of LOX enzymes was also observed, particularly between LOX/LOXL2 and between LOXL1/LOXL2. Overall, our results suggest that LOX and LOXL1-2 seem to be highly relevant for BC progression and their inhibition could be a valuable therapeutic approach. This is not true for LOXL4, while the impact of LOXL3 may vary with BC subtype.

ID: 5056

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## MODULATION OF THE DORSAL PERIAQUEDUCTAL GRAY MATTER ON BEHAVIORAL RESPONSE OF RATS SUBMITTED TO THE ELEVATED PLUS MAZE TEST AFTER ACUTE RESTRAINT STRESS

Studies indicate that stress may play a significant role on the onset of anxiety disorders; with high prevalence and different degree of severity, it affects patients' daily activities. The neurobiology of anxiety is complex and involves several areas including the dorsal periaqueductal gray matter (dPAG). In recent years, evidence have emerged that folic acid (FA) can modulate some psychiatric disorders, however, there is no study about the effect of FA on anxiety. Therefore, the present study aimed to evaluate the participation of dPAG on the behavior observed on the elevated plus maze (EPM) and open field (OF) tests of rats submitted to previous acute restraint stress. Then, Male Wistar rats (65-day-old) were submitted to acute restraint stress during 2h (CEUA n°14764201894). Following 24h, microinjections of cobalt chloride (CoCl<sub>2</sub>), a nonspecific synaptic inhibitor (1mM/50 nL) were performed into the dPAG prior to the EPM and the OF tests in order to evidence the participation of local neurotransmission in the neurobiology of anxiety caused by previous acute restraint stress. Similarly, microinjections of FA (3, 9, 15 nmol/50 nL) or vehicle (50nL) were performed into the dPAG of animals previously to the EPM and the OF tests evaluation. The administration of CoCl<sub>2</sub> into the dPAG increased the time spent in the

center (Mann Whitney= 2;  $p=0.0023$ ) and the number of crossings in the OF characterizing an anxiolytic behavior of the animal (Mann Whitney= 9;  $p= 0.0478$ ). However, an anxiogenic effect was observed in animals that received FA microinjection in the dPAG characterized by a decrease in the time spent by the animal in the center of the OF (KW= 12.5;  $p= 0.0056$ ) and in the total number of crossings (KW= 8.9;  $p= 0.0294$ ). Thus, the data suggest that dPAG may modulate the behavioral responses observed in the OF test of animals previously stressed and that FA interferes with anxiety-related behavior. However, further studies are necessary to understand the mechanisms involved in that modulation.

ID: 5059

Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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#### **EARLY VASCULAR DAMAGE IN OVERWEIGHT AND OBESE CHILDREN: ANALYSIS OF CIRCULATING ENDOTHELIAL MICROPARTICLES CD62E+ AND CD31/ANNEXIN V+**

The incidence of obesity in childhood is worrying and may precede the development of atherosclerosis, this metabolic condition disturbs the integrity of the endothelium, leading to endothelial activation, which predisposes to the release of endothelium-derived microparticles (EMPs). We measured CD31+/annexin V+ and CD62E+ EMP levels to understand their contribution to childhood endothelial damage. 107 normal weight children and 35 overweight/obese children were evaluated. Anthropometric data, blood pressure levels and biochemical profile were also retrieved and flow cytometry methods used to identify and quantify circulating EMPs CD31+/annexin V+ and CD62E+ overweight/obese children have higher circulating levels of both EMPs than those with normal weight ( $P<0.001$ ). EMP levels were positively correlated with body mass index (BMI), waist circumference, blood pressure, total cholesterol, low density lipoprotein cholesterol (LDLc) and triglycerides. The multivariate logistic regression model revealed that the risks of having high EMP levels ( $>75^{\text{th}}$  percentile) were high in children with large waist circumference and high LDLc level. The CD62E+/CD31+ EMP ratio was higher in overweight/obese children than in those with normal weight, reflecting an imbalance between endothelial cell activation and apoptosis. Finally, ROC curves were constructed comparing the discriminant capacity of waist circumference and LDLc levels. We found that LDLc showed significantly greater discrimination than waist circumference for CD31+/annexin V+ ( $P = 0.031$ ) and CD62E+ EMPs ( $P=0.041$ ). (Approval number: 3,408,882). Overweight/obese children have high circulating levels of PGA CD31+/annexin V+ and CD62E+, which may be an early sign of endothelial apoptosis and inflammatory activation in response to injury. EMP levels were positively associated with cardiometabolic risk factors. We emphasize the negative influence of high-risk metabolic endothelial profiles in the early stages of childhood obesity.

ID: 5060

Área: *Fisiologia de Órgãos e Sistemas: Respiratória*

Forma de Apresentação: *Ê-POSTER*

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## INTRINSIC AND SYNAPTIC MECHANISMS CONTROLLING THE EXPIRATORY ACTIVITY OF EXCITATORY LATERAL PARAFACIAL NEURONES OF RATS

Active expiration is essential for increasing pulmonary ventilation during high chemical drive (hypercapnia). Several studies demonstrated that the lateral aspect of the parafacial (pFL) region, which contains expiratory neurones, drives abdominal muscles during active expiration in response to hypercapnia. However, the electrophysiological properties and synaptic mechanisms determining the activity of pFL expiratory neurones, as well as the specific conditions for their emergence, are not fully understood. Protocols were approved by the Ethical Committee for Animal Experimentation of the School of Medicine of Ribeirão Preto, University of São Paulo (1/2016-1 and 3/2019). Using whole cell electrophysiology and single cell qRT-PCR techniques, we evaluated the intrinsic electrophysiological properties, the phenotype and the respiratory-related synaptic inputs to the pFL expiratory neurones, as well as the mechanisms for the expression of their expiratory activity under conditions of hypercapnia induced active expiration in *in situ* preparations of juvenile rats. We also evaluated whether these neurones possess intrinsic  $\text{CO}_2/[\text{H}^+]$  sensitivity. GABAergic and glycinergic inhibition during inspiration and expiration suppressed the activity of glutamatergic pFL expiratory neurones in normocapnia. In hypercapnia, these neurones escape glycinergic inhibition and generate burst discharges at the end of expiration. We found evidence for the contribution of post-inhibitory rebound,  $\text{Ca}_v3.2$  isoform of T-type  $\text{Ca}^{2+}$  channels and intracellular  $[\text{Ca}^{2+}]$ . Neither  $\text{CO}_2/[\text{H}^+]$  sensitivity or expression  $\text{CO}_2/[\text{H}^+]$  sensitive ion channels/receptors (TASK or GPR4) were observed. Post-synaptic disinhibition and the intrinsic electrophysiological properties of glutamatergic neurones both play important roles in the generation of the expiratory oscillations in the pFL region during hypercapnia in rats.

ID: 5061

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal do Pampa (UNIPAMPA)

## HEALTH STUDENTS' PERCEPTION ABOUT SUPPLEMENTARY PHYSIOLOGY TEACHING ACTIVITIES DURING THE ONLINE TEACHING PERIOD

The COVID-19 pandemic brought essential challenges to the teaching-learning process. It was necessary to find new ways of teaching physiology using online education. Use only the online theoretical class may not support all the students' doubts, making learning difficult. Seeking to help students and facilitate their understanding of the contents developed during the online Physiology course, we proposed Supplementary Physiology Teaching Activities (SPTA). This work aims to report the students' perceptions about the SPTA. We developed the SPTA with students enrolled in Human Physiology courses I and II of Nursing and Physiotherapy undergraduate careers of the Federal University of Pampa. The SPTA were carried out on the Google Meet platform (~1h/week). During the meetings, subjects discussed in the online theoretical class were addressed by multiple-choice questions, followed by discussion. Through problem-solving, students were encouraged to discuss the topic and explain it to colleagues with the help of tutors. At the end of the semester, we apply an online questionnaire to assess the students' perception of SPTA. In total, 62 students answered our questionnaire. 27.42% (n = 17) of the students participated in the SPTA; 53.23% (n = 33) participated very little; and 19.35% (n = 12) did not participate. When asked about the importance of SPTA, 93.55% (n = 58) of students consider it important in online education; and only 6.45% (n = 4) considers it unimportant. Finally, 54% (n = 27) of the students who participated rated the SPTA as excellent, giving a grade of 5 (maximum score); 22% (n = 11) judged

it with a grade of 4; 20% (n = 10) gave a grade of 3; 2% (n = 1) grade 2; and, 2% (n = 1) judged grade 1. Therefore, SPTA can be considered an important strategy to help students in the physiology understanding during the online teaching period due to the COVID-19 pandemic.

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Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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### **CLONIDINE, AN $\alpha_2$ ADRENERGIC AGONIST, AND CARDIOVASCULAR EFFECTS OF SALTY TASTE**

Forebrain  $\alpha_2$  adrenoceptors participate in sodium appetite-inhibitory pathways. Preliminary results are showing that 1) intraperitoneal (ip) injection of clonidine, an antihypertensive agent, interferes with orofacial somatic motor responses to intraoral 0.3 M NaCl infusion; 2) this infusion can have cardiovascular effects. The objective of this work was to investigate whether we can associate the effect of clonidine with cardiovascular alterations produced by the salty taste. Adult rats (n = 7) depleted of sodium (subcutaneous injection of furosemide + 24 h of ambient sodium removal) received ip injection first of vehicle and then (45 min) of clonidine 40  $\mu\text{g}/\text{kg}/\text{mL}$ . Fifteen min after each ip injection, two intraoral infusions (1 ml/1 min) were performed: one with distilled water, followed 5 min later by another with 0.3 M NaCl. After ip injection of vehicle, both the intraoral infusion of water and 0.3 M NaCl increased blood pressure ( $\sim 11 \pm 1$  mmHg) and heart rate ( $\sim 35 \pm 5$  bpm) in 1 min. Both increases were inhibited when 0.3 M NaCl was infused intraorally after ip clonidine injection ( $\Delta\text{MAP } 1 \pm 1$  mmHg;  $\Delta\text{FC } -20 \pm 10$  bpm vs. infusion start; vs. intraoral water infusion:  $\Delta\text{MAP } 4 \pm 3$  mmHg;  $\Delta\text{FC } +15 \pm 15$  bpm). The results suggest an association between the injection of clonidine and the cardiovascular effects of salty taste.

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Área: *Fisiologia de Órgãos e Sistemas: Endócrina*

Forma de Apresentação: *Ê-POSTER*

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### **NEONATAL OVERNOURISHING, BUT NOT NEONATAL UNDERNOURISHING, DISRUPTS CCK EFFECTS ON ENERGY HOMEOSTASIS IN ADULT MALE RATS**

Nutrition plays important role in the development of hypothalamic circuits that regulate food intake and energy expenditure. Metabolic programming induced by manipulation of litter size may challenge some regulatory processes, as the hypophagic effect of cholecystokinin (CCK). Therefore, the divergent litter size model was used to investigate the effects of CCK on food intake, neuronal activity and plasma

parameters of adult male Wistar rats. Pups were raised in litters of 3 (neonatal overnutrition/small litter – SL), 10 (control/normal litter – NL) or 16 (undernutrition/large litter – LL) pups per dam. On postnatal day 60, after 16 hours fasting, animals were intraperitoneally treated with CCK (10 µg/Kg) or saline (0.9% NaCl), and food intake, neuron activation in nucleus of solitary tract (NTS) and paraventricular nucleus of hypothalamus (PVN), expressed by the number of c-Fos immunoreactive neurons, as well as plasma parameters were evaluated (procedures were approved by Ethics Committee for Animal Use of the State University of Londrina - UEL, Protocol 18310.2019.03). CCK injection reduced food intake in NL and LL rats 1 hour after treatment, while food intake of SL group was not affected by CCK. CCK increased the number of c-Fos labeled neurons in the NTS and PVN of all groups. However, neuron activation in the NTS and PVN induced by CCK was lower in SL than NL animals, without differences between NL and LL groups in these nuclei. CCK decreased plasma levels of corticosterone of SL and LL rats, without changes in the glycemia. These results suggest that anorexigenic actions, associated with neuron activation in the NTS and PVN, induced by CCK were not disrupted by neonatal undernutrition, whereas neonatal overnutrition impaired these CCK actions. Thus, neonatal overnourishing is likely to be more damaging than neonatal undernourishing on CCK effects on energy homeostasis in the adulthood.

ID: 5064

Área: Fisiologia Comparada

Forma de Apresentação: Ê-POSTER

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### **VASCULAR REACTIVITY, ANGIOTENSIN RECEPTOR (ATR) AND INTRACELLULAR SIGNALING IN *OXYRHOPUS GUIBEI* (FALSE CORAL SNAKE), AND *CROTALUS DURISSIS TERRIFICUS* (RATTLESNAKE)**

A functional ATR with low affinity for AT<sub>1</sub>/AT<sub>2</sub> selective receptor antagonists, was characterized in the aorta of *Bothrops jararaca*-BJ, *Crotalus durissis terrificus*-Cdt and *Oxyrhopus guibei*-Og. This study aims to investigate some intracellular signaling pathways activated by this ATR, the role of the endothelium-derived factors on the AngII vasoconstriction-response, and the biological activity of two AngII analogues in the aorta of Og or Cdt. Adult snakes of both gender, 100-350g, were anesthetized, euthanized (Animal Ethics Committee 1691061115, 9738030616) and aortic rings were removed to record the AngII-cumulative curve in the absence and in the presence of Cheleretrine (Che) or GF109203X (PKC inhibitors) of the Cdt, and also to evaluate the presence of an ATR in the Cdt aorta distally from the heart (liver region). AngII analogues response ([Asp<sup>1</sup>,Val<sup>5</sup>] AngII and [Asn<sup>1</sup>,Val<sup>5</sup>] AngII) were obtained in the aorta of Og and Cdt, well as AngII response was compared in intact and denuded-endothelium aorta of both snakes. Che (10<sup>-5</sup>M n=8) didn't modify AngII effect in Cdt aorta, but GF109203X (10<sup>-5</sup>M n=4) produced an AngII maximum-effect reduction (65%). The endothelium removal didn't modify the AngII vasoconstrictor effect in Og n=3 pD<sub>2</sub> 5.9 to 6.0 and Cdt n=7.6.4 to 6.7, [Asp<sup>1</sup>,Val<sup>5</sup>] AngII analogue was as potent as the human AngII in Cdt n=2 pD<sub>2</sub> 6.0 to 6.1 differently from [Asn<sup>1</sup>,Val<sup>5</sup>] AngII which was less active in Og n=2 pD<sub>2</sub> 5.8 to 3.9 and Cdt n=1, 6.0 to 5.4. AngII-vasoconstriction effect was detected in Cdt aorta distally from the heart showing a functional ATR in this region. These results indicate that any PKC isoform is involve in the Cdt-AngII response. Endothelium-derived factors didn't collaborate to AngII effect in Og and Cdt, and [Asn<sup>1</sup>,Val<sup>5</sup>] AngII was the less potent analogue in both snakes, as observed in the BJ snake (aorta/heart). Our data contribute to the knowledge of the renin-angiotensin system in vertebrates and provide insight into the understanding of snake ATR.

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Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### CECAL LIGATION AND PUNCTURE MODEL OF SEPSIS IN WISTAR RATS PRESENTS EARLY INSULIN RESISTANCE

Sepsis is a systemic inflammatory response secondary to an infectious process that leads to multiple organ failure. It usually follows a biphasic course, induced by an early hypermetabolic state, followed by a hypometabolic state characteristic of septic shock. The early phase is characterized by insulin resistance, hyperglycemia, and hyperinsulinemia, while the late phase shows hypoglycemia, which occurs due to the suppression of hepatic glucose production and the increased use of glucose by tissues rich in macrophages. The aim of the study was to evaluate peripheral insulin sensitivity in the acute and late phases of sepsis induced by cecal ligation and puncture (CLP) in male Wistar rats. Thus, the insulin tolerance test (ITT) and the calculation of plasma glucose disappearance rate (kITT) were performed, data were expressed as mean  $\pm$  standard error and the significance level was set at 5% ( $p < 0.05$ ). The significance was tested by unpaired Student's t test. All procedures were approved by Ethics Committee of State University of Londrina (protocol 4436.2018.31, of. Letter 65/2018). The *Sepsis* group showed insulin resistance observed by higher blood glucose than *Sham* (time 15 min *Sham*:  $82 \pm 5.5$ ; *Sepsis*:  $108 \pm 8.4$  mg/dL) in ITT and by a lower kITT (*Sham*:  $3.22 \pm 0.37$ ; *Sepsis*:  $1.82 \pm 0.44$  % min<sup>-1</sup>) after 8 hours of CLP. Even after 18 hours of the induction of sepsis, insulin resistance was observed by the reduced kITT (*Sham*:  $5.31 \pm 0.50$ ; *Sepsis*:  $3.79 \pm 0.32$  % min<sup>-1</sup>) and increased plasma glucose (time 15 min *Sham*:  $40 \pm 3.54$ ; *Sepsis*:  $51 \pm 2.3$  mg/dL). In conclusion, the insulin resistance starts early and perpetuates until the late stage of sepsis. The basal hyperglycemic and hypoglycemic phases were not observed after 8 and 18 hours of sepsis onset, respectively, although such phenomena may occur in periods other than those analyzed. This observation is indicative of preservation, at least partially, of insulin secretion in the face of the early installation of insulin resistance.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### CARDIOVASCULAR AND AUTONOMIC PROFILE OF AWAKE MICE SUBMITTED TO SUSTAINED HYPOXIA

Mice submitted to sustained hypoxia (SH) presented a significant reduction in baseline heart rate (HR), increased bradycardic response to chemoreflex activation, and increased cervical vagus activity, suggesting an autonomic imbalance in favor of the parasympathetic component. However, whether the observed reduction in baseline HR was due to an increase the parasympathetic tone to the heart

was not evaluated. To evaluate the cardiovascular and autonomic profile of awake mice submitted to SH, C57BL/6 mice under anesthesia had catheters inserted into the femoral artery for recording arterial pressure (MAP) and jugular vein for drug administration. Four days after the surgery, mice were submitted to normoxia or SH (24h, FiO<sub>2</sub> 0.1). At the end, the cardiovascular responses to sequential autonomic blockade of parasympathetic tone to the heart (methyl-atropine; 1mg/Kg) and sympathetic tone to the heart (propranolol; 3mg/Kg) and arterioles (prazosin; 1mg/Kg) were recorded. Statistical analysis was performed by nonpaired Student's t test and non-parametric Mann–Whitney test. All experimental protocols were approved by institutional ethical committee (#140/2019). Mice of the SH group (n=8) presented a significant increase in the baseline HR after methyl-atropine (184±84 vs 67±38 bpm, P=0.005) but no major changes in the baseline MAP (-7±8 vs -9±10 mmHg, P=0.7445) when compared to the control (n=7). Mice from control and SH groups presented similar cardiovascular responses to propranolol and prazosin. We are showing that SH in mice produces an autonomic imbalance favoring the parasympathetic tone to the heart, which explain the significant reduction in the baseline HR. However, the tachycardic response to the blockade of the parasympathetic tone to the heart produced no changes in baseline MAP, indicating that the lack of hypertension in mice submitted to SH is due mechanisms other than an increased parasympathetic tone to the heart.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **EFFECT OF TEXTUAL WARNINGS ON BRAIN REACTIVITY TO ULTRA-PROCESSED FOOD PRODUCTS: AN EVENT RELATED POTENTIAL STUDY**

Ultra-processed food products (UPPs) are industrial formulations that are high in sugar, sodium, and saturated and/or trans fats; with high energy densities. Marketing matches these products with pleasant situations, contributing to the increased consumption over the years. However, little is known about the impact of text warnings on the brain processing of UPPs. The aim was to investigate whether it is possible to modulate brain responses through antecedent texts that inform participants of the negative health consequences of UPPs consumption. The 26 participants (19 women and 7 men), aged 18 to 30 years (M = 21.84 ± 2.40), performed a task where they were exposed to UPPs pictures that were preceded by either (1) information about their health impact (warning condition) or (2) information about how to store food (control condition). After each picture, subjects rated it with respect to valence, arousal, and intention to consume. During the test, cortical electrical activity was recorded with electroencephalogram (EEG) for analysis of an event related potential known as late positive potential (LPP), an electrophysiological index of emotional impact. All procedures were approved by the local ethics committee (CAAE: 92088518.8.0000.5699), and all participants gave informed consent. Preliminary results show that subjects rated UPPs pictures in the warning condition with significantly lower valence compared to the control condition (M = 5.23 ± 1.29 and M = 5.67 ± 1.01, respectively, p<0.05). Furthermore, the LPP mean peak amplitude was significantly higher in the warning condition compared to the control condition (F(1,25)= 6.67, p<0.05). Thus, the warning texts employed in the present study were effective in modulating both participants' subjective evaluation and brain reactivity to UPPs pictures.

ID: 5068

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **MELANIN-CONCENTRATING HORMONE (MCH) IN THE LATERAL HYPOTHALAMUS AREA (LHA) MODULATES THE HYPERCAPNIC CHEMOREFLEX IN RATS**

Central chemoreception is a mechanism important to acid-base balance. The melanin-concentrating hormone (MCH) is a neuropeptide produced by neurons located in some areas of the CNS, mainly in the region of the lateral hypothalamus (LHA). Evidence suggests the participation of MCH in the modulation of the hypercapnic chemoreflex, however, the mechanisms involved were not investigated too far. To evaluate the role of MCH acting on MCH1-R in the LHA in the modulation of the hypercapnic chemoreflex. We injected MCH [0.4 mM] and the MCH1-R antagonist, SNAP-94847 [63 mM] bilaterally into the LHA of male Wistar rats (250-330g) and measured pulmonary ventilation (VE) using a whole-body plethysmograph, together with body temperature (Tb), EEG and EMG during normocapnia and hypercapnia (7% CO<sub>2</sub>). All procedures were approved by the Ethics Committee of Use of Animals (CEUA - IBB, UNESP, Botucatu, SP, protocol No. 1104-CEUA). MCH injected into the LHA caused a decreased ventilatory response to hypercapnia during wakefulness (2645 ± 120; n = 6 vs 1923 ± 145 ml, kg-1 min-1; n = 7; P < 0.05) and sleep (2273 ± 121; n = 4 vs 1914 ± 93 ml, kg-1 min-1; n = 6; P < 0.05) in the light, but not in the dark period. The injection of MCH1-R antagonist caused an increase in the ventilatory response to CO<sub>2</sub> during wakefulness (2106 ± 134; n = 6 vs 2547 ± 113 ml, kg-1 min-1; n = 6; P < 0.05) but not during sleep (1912 ± 152; n = 4 vs 2074 ± 159 ml, kg-1 min-1; n = 04; P < 0.05) in the light phase. Our results suggest that MCH via MCH1-R in the LHA perform an inhibitory modulation of the hypercapnic ventilatory response during wakefulness and sleep only in the light period of the diurnal cycle.

ID: 5069

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### **PARICALCITOL IMPROVES RENAL FUNCTION AND STRUCTURE IN THE KIDNEY INJURY ON ADRIAMYCIN-INDUCED NEPHROPATHY**

A single dose of Adriamycin (ADR) induces progressive proteinuria associated with renal structural and functional disturbances. Paricalcitol (PCal), a vitamin D-activated analogous, has been considered as an intervention in clinical trials of CKD. We evaluated the effect of paricalcitol treatment in renal disturbances. Ethics Committee Number: 194/2017. Thirty-two male SpragueDawley rats (5-week) were treated with PCal (mini-osmotic pumps) two days before ADR (3.5mg/kg, i.v) or saline injection. On the 27th day serum/plasma and 24-hours urine samples were collected to evaluate urinary albumin excretion (UAE), glomerular filtration rate (GFR), sodium excretion fraction (FENa+), and 25-dihydroxyvitamin D

(25OHD). Additionally, blood pressure (BP) and renal histology and morphology were analysed. The ADR group presented increased FENa<sup>+</sup> ( $0.35\pm 0.08$  vs  $0.30\pm 0.06$ ) and decreased GFR ( $0.26\pm 0.07$  vs  $0.29\pm 0.09$ ;  $p<0.5$ ), and a tendency to reduce 25OHD levels compared to the control groups ( $p>0.05$ ). These alterations were less intense in the ADR+ PCal group  $0.25\pm 0.04$  vs  $0.35\pm 0.08$ ;  $0.36\pm 0.03$  vs  $0.26\pm 0.07$  respectively, and in BP  $137\pm 15.6$  vs  $114\pm 10.8$ ;  $p<0.05$ . Besides, an increase of UAE was observed on the 15th day ( $0.4\pm 0.09$  vs  $0.11\pm 0.13$ ;  $p<0.05$ ) and was higher on the 25th day ( $0.7\pm 0.19$  vs  $0.1\pm 0.08$ ;  $p<0.001$ ) after ADR injection compared with the control groups. The ADR+ PCal group showed an expressive reduction on this parameter ( $0.39\pm 0.2$  vs  $0.12\pm 0.08$ ;  $p<0.001$ ). The morphometric study showed the presence of tubulointerstitial fibrosis in the cortex and medullary compartment in the rats of the ADR groups that were less intense in the PCal treated rats ( $p<0.01$ ). The fractional mesangial area was increased in the animals of the ADR groups which was reduced with PCal treatment ( $p<0.001$ ). In conclusion, the results showed that the animals ADR injected presented alterations on the UAE and in renal function and structure, which was attenuated by the PCal treatment.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **SYMPATHETIC AND ANGIOTENSINERGIC TONE AND ARTERIAL PRESSURE AFTER THE INHIBITION OF CATALASE WITH 3-AMINO-1,2,4-TRIAZOLE IN SHRS**

Increase of endogenous H<sub>2</sub>O<sub>2</sub> by catalase blockade with 3-amino-1,2,4-triazole (ATZ) reduces the pressor responses to central angiotensin II (ANG II) in hypertensive rats. Here, we investigated sympathetic and angiotensinergic tone controlling arterial pressure in awake spontaneously hypertensive rats (SHRs) treated with ATZ administered intravenously (iv). Adult SHRs with femoral artery and vein cannulas were used. Mean arterial pressure (MAP) and heart rate (HR) were recorded in freely moving SHRs. Rats were randomly divided into 2 groups that received either ATZ (300 mg/kg of body weight, n=13) or vehicle (saline, n=12) iv. MAP and HR were recorded before (baseline), 2 and 4 hours after ATZ or saline iv. Then, the rats received ganglionic blocker hexamethonium (30 mg/kg of body weight iv) to evaluate sympathetic tone, and 15 min later they received the ANG II type I receptor antagonist losartan (30 mg/kg of body weight iv) to evaluate the angiotensinergic tone. ATZ produced no change in MAP after 2 h ( $170\pm 3$  mmHg), but reduced MAP after 4 h ( $161\pm 4$  mmHg, vs. baseline MAP:  $176\pm 3$  mmHg,  $p<0.05$ ). Saline did not change MAP after 2 and 4 h ( $170\pm 3$  and  $164\pm 3$  mmHg, respectively, vs. baseline MAP:  $174\pm 5$  mmHg). ATZ produced no change in HR after 2 h and 4 h ( $332\pm 9$  and  $358\pm 9$  bpm, respectively, vs. baseline HR:  $331\pm 10$  bpm). Hexamethonium produced less reduction in MAP in SHRs treated with ATZ ( $-27\pm 4$  mmHg,  $p<0.05$ ) compared with saline group ( $-38\pm 4$  mmHg). Hexamethonium produced similar increase in HR after either saline ( $37\pm 10$  bpm) or ATZ ( $26\pm 11$  bpm). The subsequent injection of losartan reduced MAP only after ATZ ( $-20\pm 4$  mmHg, vs. saline  $0\pm 4$  mmHg,  $p<0.05$ ), with no change in HR ( $-6\pm 8$ , vs. saline:  $-2\pm 4$  bpm). The results suggest that ATZ i.v. decreases sympathetic tone and arterial pressure in SHRs, while circulating ANG II increases.

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Área: Neurofisiologia

*Forma de Apresentação: Ê-POSTER*

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### **ROLE OF PEDUNCULOPONTINE TEGMENTAL NUCLEUS FOR BREATHING CONTROL IN A MICE MODEL OF PARKINSON'S DISEASE**

Parkinson's disease (PD) is a motor disorder resulting from a degeneration of dopaminergic neurons of Substantia Nigra compacta (SNpc), with classical and non-classical symptoms such as respiratory instability. An important region for breathing pattern, the Pedunculopontine Tegmental Nucleus (PPTg) is composed of cholinergic, glutamatergic and GABAergic neurons. Our main hypothesis is that PPTg neurons have been degenerated in a PD model; secondly, we hypothesize that PPTg neurons are able to increase their chemoreflex-induced activity, after PD-induction. We used 30 adult mice (~25g) that express the fluorescent green protein in cholinergic, glutamatergic or GABAergic cells specifically (Chat-cre Ai6, VGlut2-cre Ai6 and VGat-cre Ai6) (CEUA: 6641200919). All animals received bilateral intrastratial injection of vehicle or 6-hydroxydopamine (6-OHDA, 10 µg/µl). Ten days later, the animals were exposed to hypercapnia (7% CO<sub>2</sub>, 21% O<sub>2</sub>, balanced with N<sub>2</sub>, 3h) or hypoxia (8% O<sub>2</sub>, balanced with N<sub>2</sub>, 1h) to activate PPTg neurons. At the end, we performed immunohistochemistry for tyrosine hydroxylase (TH) in SNpc; fos and choline acetyltransferase (ChAT) in PPTg. We characterized the pattern of cholinergic PPTg neurons and found that 20% of the total VGlut2, Ai6 are cholinergic and only 1% of the total VGat, Ai6 are cholinergic. Next, we have shown that the number of TH neurons in SNpc from 6-OHDA injected mice reduced 77% compared to control (103 vs. sham: 443 neurons, p<0.001) without changing the number of VGlut2+ neurons (1607 ± 59 vs. control: 1832 ± 240 neurons, p>0.05) in the PPTg. The number of hypercapnia-activated VGlut2 neurons were reduced (7 vs. sham: 21, p<0.05) in PD. Hypoxia did not activate PPTg neurons. Although our results did not show a reduction in the number of glutamatergic neurons in PPTg, we observed a reduction in the number of neurons activated by hypercapnia in PD animal model, suggesting that PPTg may participate in the hypercapnia ventilatory response.

*ID: 5076*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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### **LATERODORSAL NUCLEUS DEGENERATION IN A MICE MODEL OF PARKINSON'S DISEASE**

Parkinson's disease (PD) is a progressive neurodegenerative motor disorder resulting from a degeneration of dopaminergic neurons of Substantia Nigra compacta (SNpc). PD patients present classic symptoms and non-classic symptoms such as cognitive deficiencies, sleep disturbances and respiratory instability. It has been described the role of Laterodorsal Tegmental Nucleus (LDTg) for sleep regulation and breathing pattern. This region is composed of cholinergic, glutamatergic and GABAergic neurons, which provides inputs strategically to dopaminergic rostral areas importantly to movements adjustments. Our main hypothesis is that LDTg have been degenerated in a PD-model and the remaining neurons in the PD-mice could be able to increase their activity induced by high levels of CO<sub>2</sub>. We used 30 adult mice (~25g)

that express the fluorescent green protein in cholinergic, glutamatergic or GABAergic cells specifically (Chat-cre Ai6, VGlut2-cre Ai6 and VGat-cre Ai6; N=5/group) (CEUA: 6641200919). All animals had been induced to the PD-model by receiving intrastriatal 6- hydroxydopamine (6-OHDA, 10 µg/µl) or vehicle injections bilaterally. Ten days after the surgery, the animals were exposed to hypercapnia (7% CO<sub>2</sub>, 21% O<sub>2</sub>, balanced with N<sub>2</sub>, 3 hours) to promote activation of chemosensitive neurons in the LDTg. First, we characterized the pattern of cholinergic PPTg neurons and found that 15% of the total VGlut2, Ai6 are cholinergic (ChAT+) and 0.5% of the total VGat, Ai6 are ChAT+. Next, we noticed that the number of TH-stained neurons in the SNpc in 6-OHDA injected mice was reduced by 77% compared to vehicle (103 ± 4 vs. vehicle: 443 ± 9 neurons, p<0.001). The number of ChAT+ LDT neurons reduced (440 ± 37 vs. vehicle: 593 ± 30 neurons, p<0.05) in PD. We did not find hypercapnia-activated neurons (fos+) in ChAT-immunoreactive LDTg neurons. Our data suggest that dysfunction of cholinergic neurons within the LDT must have a significant correlation with breathing impairment observed in PD.

ID: 5078

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal do Rio de Janeiro (UFRJ)

### **RAPAMYCIN INDUCES PROTEINURIA THROUGH REDUCTION OF PROXIMAL TUBULE MEGALIN MEDIATED PROTEIN ENDOCYTOSIS**

Rapamycin is an immunosuppressive drug that acts by inhibiting the mTOR signaling pathway. Clinical use of rapamycin is commonly used in kidney transplanted patients. However, a significant proportion of individuals develop or increase previous existing proteinuria. To better understand the effect of rapamycin on the generation of proteinuria, we aimed to investigate its effect on the renal function of Balb/c mice, especially on the protein reabsorption capacity. Eight weeks-old male Balb/c mice received a daily dose of 1.5 mg/kg rapamycin by oral gavage for 7 consecutive days (CEUA-045/17). Animals (n=4/group) were kept in metabolic cage and 24h urine was collected for renal function analysis. For comparison among experimental groups, one-way analysis of variance was used followed by the Tukey's post-test (P<0.05 was considered statistically significant). Histological analysis of PAS-stained kidney sections showed no gross alterations of glomerular and tubular morphology, interstitial space, and cellular infiltrate. Functional analysis revealed no changes on plasma creatinine, blood urea nitrogen, and creatinine clearance after rapamycin treatment. However, it was observed a significant increase in protein excretion (mg/24h) on day 1 (D1; 9.65±2.26), day 3 (D3; 8.2±1.7) and day 7 (D7; 2.5±0.6) in relation to the control (0.9±0.2). Urinary γGT activity (U/L), a specific marker of proximal tubule damage, was increased in D1 (133.4±10.0), D3 (72.5±26.1) and D7 (65.7±22.6) in relation to the control (39.39±13.88). Renal cortical uptake of FITC-albumin was inhibited significantly in all rapamycin treated groups. Immunofluorescence analysis showed a decrease on the expression of megalin of proximal tubules in rapamycin treated animals. Based on these results, we suggest that rapamycin-induced proteinuria might result from a reduced megalin-mediated endocytosis of kidney proximal tubules.

ID: 5079

Área: Fisiologia Celular

*Forma de Apresentação: Ê-POSTER*

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### **MODULATION IN CARDIOMYOCYTE TROPHISM INDUCED BY CONDITIONED MEDIA OF RENAL CELLS IN HYPOXIA: SCR 3 MODEL *IN VITRO***

The cardiorenal syndrome type 3 (CRS 3) is characterized by an acute renal injury that leads to cardiac damage. Hypoxia as a model of kidney injury can damage the heart through the expression of genes related to the inflammatory process, in addition to regulating the expression of enzymes such as nitric oxide synthases that control the release of nitric oxide (NO). Therefore, the aim of this study was to mimic CRS3 *in vitro* and verify the influence of inflammatory mediators produced by renal cells preconditioned to hypoxia on cardiac cells, in addition to analyzing the role of NO. HEK293 renal cell lineage was cultivated and submitted to hypoxia for 16 hours and 8 hours of reoxygenation using the GasPak EZ System (BD). The conditioned media from HEK293 was transferred to H9c2 cells for 24 hours, treated or not with 1 mM of L-NAME. RT-qPCR was performed to evaluate gene expression. Data were expressed as mean  $\pm$  standard deviation values of  $p < 0.05$  were considered significant. It was possible to mimic the effects of cardiorenal syndrome in the cellular model, since H9c2 cells conditioned in a HEK293 cell culture media after hypoxia had an 87.27% increase in ANF expression, indicating a possible hypertrophy. Furthermore, the treatment with L-NAME was able to prevent the cardiomyocyte hypertrophy induced by conditioned media from HEK293. In relation to inflammatory profile, H9c2 didn't show any alterations in IL-6 and IL-1 $\beta$  gene expression which may indicate the participation of other inflammatory molecules that will be further investigated. Renal cell hypoxia is able to modulate cardiac trophism, as observed in other *in vivo* studies from our laboratory, using a renal ischemia and reperfusion model. Additionally, the NO pathway seems to play an important role in the modulation of cardiac trophism in the experimental model.

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*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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### **COMPARATIVE EFFECTS BETWEEN ASSISTED AND CONTROLLED MECHANICAL VENTILATION UNDER CONSERVATIVE AND LIBERAL FLUID STRATEGIES IN EXPERIMENTAL ACUTE RESPIRATORY DISTRESS SYNDROME**

Mechanical ventilation and fluid therapy are cornerstones in acute respiratory distress syndrome (ARDS) management. Still, little is known about these therapies' interactions. The study was approved (UFRJ-038-18) and investigated cardiopulmonary and kidney morphology in an ARDS model receiving conservative (C) or liberal (L) fluid therapy and pressure support (PSV) or pressure-controlled ventilation (PCV). 24 male Wistar rats ( $\approx$ 16weeks, 400g) were randomized in 4 groups: CPCV, CPSV, LPCV and LPSV (n=6, each). LPS was intratracheally instilled and 24h later animals were ventilated (VT $\approx$ 6ml/kg;

PEEP=3cmH<sub>2</sub>O; FiO<sub>2</sub> =0.4) for 1h under ketamine/midazolam anesthesia. C groups received minimum lactated ringer for mean arterial pressure (MAP)≥70mmHg while L received ≈4-fold-higher C's fluid. PCV group received neuromuscular blockage (pancuronium bromide), while PSV did not receive. MAP and arterial blood gases were observed and cardiac output (CO), stroke volume variation (SVV), vena cava collapsibility index (VCCI) and PAT/PET (pulmonary acceleration and ejection times ratio) were monitored at initial (T0) and final (T60) by echocardiogram. Rats were euthanized and lungs and kidneys sampled. LPSV and LPCV received 4.8 times more fluid than C groups (p<0.05). There were no differences in PaO<sub>2</sub>/FiO<sub>2</sub>, pH, PaCO<sub>2</sub>, HCO<sub>3</sub><sup>-</sup>, CO, MAP, and static compliance among groups. LPCV SVV (T0:58 ± 23%; T60:35 ± 20%) and VCCI (T0:29 ± 9%; T60:11 ± 7%) showed significant reduction over time (p<0.05) indicating that L fluid strategy impacted hemodynamics. Brush border analysis and acute kidney injury score were similar among groups, suggesting kidney integrity despite fluid and ventilatory strategy. Groups had similar alveolar heterogeneity but LPSV (0.75 ± 0.13) and LPCV (0.77 ± 0.11) yielded higher perivascular edema (p<0.05) than CPCV (0.62 ± 0.08) suggesting that L fluid strategy regardless of type of ventilation may lead to perivascular edema though no functional changes were observed in injured lung.

ID: 5082

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### **ALBUMIN OVERLOAD IMPAIRS ALBUMIN ENDOCYTOSIS IN PROXIMAL TUBULE CELLS INJURY THROUGH INCREASED O-GLCNACYLATION**

Renal disease is strictly associated with urinary protein loss, proteinuria, a condition that reflects protein overload at the proximal tubule epithelial cells, PTECs. It is well known that albumin overload promotes renal disease progression. Identifying the molecular mechanisms mediating this process is essential for the development of new treatments. Our group has previously demonstrated an association among essential hypertension and tubular proteinuria with development of tubule-interstitial injury. The molecular mechanism involved hyper-O-GlcNAcylation in PTECs, but the trigger of this process is unknown. Here, we aimed to study the possible role of PT albumin overload as a trigger for dysregulated O-GlcNAcylation and its impact in PT albumin endocytosis. LLC-PK1 cells, a well characterized PTECs, were incubated overnight with 20 mg/mL albumin mimicking PT albumin overload. LLC-PK1 cells were transfected with minimegalin constructs, tagged with hemagglutinin epitope (mMeg-HA), to study the traffic and expression of megalin, a receptor involved in PT albumin endocytosis. Albumin endocytosis was assessed by albumin-FITC. Surface megalin expression was determined by confocal microscopy. O-GlcNAcylation was also evaluated in 2 different animal models: 1) subclinical acute kidney injury, subAKI; 2) Adriamycin-induced nephropathy (CEUA-045/17). Initially, we observed that the incubation of the cells with albumin induced: 1) an increase in O-GlcNAcylation; 2) a reduction in albumin binding and endocytosis; 3) a reduction of surface mMeg-HA expression. Thiamet G (5 µM), an O-GlcNAcylation enhancer, mimicked these effects. On the other hand, OSM-1, an inhibitor of O-GlcNAcylation, blocked the albumin effect on O-GlcNAcylation, albumin endocytosis and mMeg-HA expression. Importantly, subAKI and adriamycin-induced nephropathy mice models showed increased renal cortex O-GlcNAcylation correlated with decreased proximal tubule albumin endocytosis and reduced megalin expression. In conclusion, our results indicate that albumin overload impairs PT protein reabsorption by a mechanism involving an increase in O-GlcNAcylation, which decreased megalin surface expression. We proposed that this mechanism promotes the development of

progressive renal dysfunction in proteinuric conditions.

ID: 5084

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **PERCEPTION AND ACADEMIC PERFORMANCE OF PHYSICAL EDUCATION UNDERGRADUATE STUDENTS IN HUMAN PHYSIOLOGY AND EXERCISE PHYSIOLOGY COURSEWORKS**

Currently in Brazil, Physical Education (PE) undergraduate courses are in a period of reformulation of the curricula due to new National Curriculum Guideline created by Brazilian Ministry of Education. In new National Curriculum Guideline, there is a lack of objective criteria for the definition of curricular components and their order in the formative process. The Human Physiology and Exercise Physiology courseworks provide the foundation for understanding physiological systems during rest and exercise. The aims of this study were to characterize the perception of PE undergraduate students about the difficulty and importance of both courseworks for professional practice and to compare the academic performance in the Exercise Physiology coursework among students who attended (or not) Human Physiology coursework before taking the Exercise Physiology coursework. In total, 76 PE students, who had attended the Exercise Physiology coursework, answered an online questionnaire. Students' academic performance was analyzed. Among all participants, 65.7% and 75.0% evaluated Human Physiology and Exercise Physiology courseworks difficult/extremely difficult, respectively, and 92.1% and 97.4% considered them important/extremely important for professional practice, respectively. The academic performance in the Exercise Physiology coursework of students who had previously attended the Human Physiology class [n=61, mean:  $7.9 \pm 0.9$  (mean  $\pm$  standard deviation)] was significantly higher ( $p < 0.001$ ) compared to the academic performance of students (n=15, mean:  $5.4 \pm 2.0$ ) who had not attended or attended, but had failed the Human Physiology coursework. Although most students reported that the Human Physiology and Exercise Physiology courseworks are difficult/extremely difficult, students recognize the importance of these courseworks. It is mandatory to highlight the importance of the Human Physiology coursework as requirement for the student to attend Exercise Physiology coursework.

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Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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## DEFINING GENITAL TRACT CYTOKINES SIGNATURE OF SEXUALLY TRANSMITTED INFECTIONS IN ADOLESCENTS AT HIGH RISK OF HIV INFECTION

Sexually transmitted infections are a global public health problem. High prevalence, morbidity and health costs justify the concern of public health managers. The incidence is on the rise in Brazil especially in adolescents (15-24 y.a). Besides HIV/AIDS, other STIs presents great relevance such as gonorrhoea, chlamydia and mycoplasmas. STIs cause inflammatory cytokine upregulation and immune cell recruitment to the genital mucosa. Although inflammation plays an important role in STI clearance, could also contribute to STI-associated microbes access deeper tissues. In addition, induced immune cells releases elevated cytokine concentrations as TNF- $\alpha$ , IL- $\beta$  and IL-6 in the genital tract that may facilitate HIV infection. This study aims to define the signature of pro-inflammatory cytokines in young adolescent men who have sex with men (aMSM) and transsexual women (TrMTs), aged 15 to 19 years, included in the "Study PrEP 15-19" (Ethics Protocol WHO: 3.524.791) in the city of Salvador-Bahia, at high risk of HIV infection related to other STI as *Neisseria gonorrhoeae*, *Chlamydia trachomatis* and mycoplasmas. Biological samples will be collected from each participant at the time of inclusion in the baseline of the PrEP study. Samples will be obtained by swab friction on the oropharyngeal mucosa, anal crypts and penile urethral mucosa. The detection of *Neisseria gonorrhoeae*, *Chlamydia trachomatis* and mycoplasmas (*Mycoplasma genitalium*, *Mycoplasma hominis*, *Ureaplasma urealyticum*, *Ureaplasma parvum*) will be made by using real-time PCR. Cytokine levels (IL-1 $\beta$ , IL-6 and TNF- $\alpha$ ) will be measured through the eBioscience ELISA kit. Thus, it is expected contribute to better understand the cytokine signature in this key population highlighting anatomical sites, still low explore, as the penile mucosa. Secondary benefits of the study also include early diagnosis and treatment of STIs in the population study.

ID: 5087

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de Rondonópolis (UFR)

## EFFECT OF FUT-175 ON THE PATHOPHYSIOLOGY OF ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) IN MICE WITH EXPERIMENTAL CEREBRAL MALARIA (ECM)

Malaria-associated acute respiratory distress syndrome (MA-ARDS), characterized by microhaemorrhages, leukocyte infiltration and edema in the lungs, is a manifestation of severe malaria that can result from infection with various *Plasmodium* species including *P. falciparum*, *P. vivax* and *P. knowlesi*. Even with traditional anti-malarial treatment, some complication as MA-ARDS causes lethality. Here, we aimed to investigate the effect of FUT-175 on ARDS pathogenesis in mice with ECM. C57BL/6 mice, male, 20-25 grams weight and 10 weeks old, were infected with *P. berghei* ANKA (PbA) and treated with 5 mg/Kg/day FUT-175. At day seven the animals were euthanized according the Animal Committee 059/17. Histological analysis to determine the interalveolar septum area, edema and infiltration was carried out. Immunolocalization of VE-cadherin and occludin proteins in lung parenchyma was also performed. mRNA expression levels of TLR2 and TLR4 from lung tissue were quantified. Statistical analysis of hematoxylin/eosin-stained sections revealed that PbA-infected mice treated with FUT-175

had lower enlargement of the interalveolar septum, less edema and infiltration, and higher alveolar space compared to PbA-infected mice. Immunolocalization of VE-cadherin and occludin, showed better integrity vascular and higher distribution at the membrane of alveolar epithelium of PbA-infected mice treated with FUT-175 than infected and non-treated animals. On the other hand, maintaining occludin at the alveolar membrane, FUT-175 contributes to improving both cellular function and permeability. TLR2 and TLR4 mRNA expression levels showed association with inflammation and edema. Nevertheless, the treatment with FUT-175 diminished the inflammation and edema, reduced the enlargement of interalveolar septum and increased the alveolar area in PbA-infected mice. Based on our results, we postulate that FUT-175 may be considered as a promising drug to treat the respiratory phenotype of severe malaria.

*ID: 5089*

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER*

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### **EXPERIMENTAL CEREBRAL MALARIA (ECM) AS A MODEL TO STUDY ACUTE RENAL INJURY (AKI)**

*Plasmodium falciparum* and *P. vivax* cause severe malaria with serious repercussions in public health worldwide, due to its great impact of morbidity and mortality on populations, especially on children and elderly. The pathogenesis of malarial AKI is not fully understood and different hypothesis including hemodynamic perturbations, immune-mediated glomerular injury and metabolic disturbances were proposed to explain the mechanism. In order to investigate the malarial AKI pathogenesis, we proposed to evaluate the level of glomerular and tubular injury in an animal model of ECM. The C57BL/6 mice, male, 20-25 grams weight and 10 weeks old, were infected with *P. berghei* ANKA at day seven when the animals were euthanized, following the Animal Committee 059/17. Histological analysis and measurements of the Bowman's space and glomerular area of 150 glomeruli images for each condition were done. Serum creatinine and transcript levels of the NHE3 and NaPi2 renal transporters were quantified. Glomerular IgG deposition was determined by immunofluorescence assay. Statistical analysis of hematoxylin/eosin-stained sections revealed that PbA-infected mice showed enlargement of the Bowman's capsule space and increased glomerular area. Infected mice showed serum creatinine level higher than 4.5 mg/dL compared to 3.3 mg/dL from non-infected mice. NHE3 and NaPi2 mRNA levels were two- and five-fold less abundant in ECM, respectively. Immunofluorescence assay detected IgG deposition in the glomerulus of Pba-infected mice. Plasmodium infection caused glomerulonephritis and renal tubulointerstitial damage. Moreover, loose of kidney function was observed by elevated serum creatinine and IgG deposition in glomeruli. Decreased NHE3 and NaPi2 transcript levels suggest tubular reabsorption impairment in the proximal tubule. Surprisingly, this murine model of ECM reproduced the pathogenesis of AKI and therefore may represent a powerful tool to help understand the AKI in human malaria.

*ID: 5090*

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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### **THERAPEUTIC ROLE OF MONONUCLEAR CELLS DERIVED FROM BONE MARROW IN AN EXPERIMENTAL MODEL OF SEPSIS**

Sepsis may cause organ dysfunction due to host's immune response to an infection. Although cell therapy has beneficial effects, little is now about its effects on lung and kidney in a temporal analysis. The study was approved (CEUA 116/16) and evaluated the bone marrow derived mononuclear cells (BMDMCs) therapy in polymicrobial sepsis model. Female C57BL/6 mice (~22 weeks) were randomly divided into 1) CLP group, sepsis was induced by cecum ligation and perforation; 2) Sham group, submitted to surgery procedure without CLP. After 1 hour, CLP group received saline (CLP-Saline) or 106 BMDMCs via jugular vein. After 6h, 12h and 24h, lung and kidney morphology and molecular biology were evaluated. The diffuse alveolar damage (DAD) score was higher at 6h, 12h and 24h in CLP-Saline than Sham group. BMDMCs therapy reduced DAD score at 6h and beyond. Lung mRNA expression of KC (inflammatory marker) was higher in CLP-Saline than Sham group at 6h, 12h and 24h. BMDMCs therapy reduced lung KC mRNA levels at 6h and beyond. In addition, lung mRNA expression of IL-10 (anti-inflammatory marker) was higher CLP-Saline group at 6h but reduced significantly after 12h. On the other hand, BMDMCs therapy-maintained lung IL-10 mRNA expression on higher levels at 12h and 24 h. The acute kidney injury score revealed tubular injury at 6h and 12 h due to increased glomerular and interstitial inflammation. BMDMCs therapy reduced tubular injury at 6h and interstitial inflammation at 12h. In addition, the kidney mRNA expression of KIM-1 and IL-18 were higher in CLP-Saline than Sham group at 6h and 12h, respectively. BMDMCs therapy reduced KIM-1 (at 6 h) and IL-18 (at 12h and 24h), suggesting a reduction in renal cell damage. NGAL was also evaluated in kidney tissue. NGAL was higher in tubular epithelial cells in CLP-Saline group, while BMDMCs therapy reduced NGAL expression in all analyzed times. BMDMCs reduced both lung and kidney damage in a distinct time fashion behavior.

*ID: 5097*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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### **EFFECT OF POOR PROTEIN DIET DURING ADOLESCENCE IN THE HEART AND BRAINSTEM OF HYPERTENSIVE ADULT RATS**

Exposure to low protein diet in perinatal life induces hypertension related to cardiovascular in adulthood. However, it is not known if this insult during adolescence affects the cardiovascular system and redox status. This study aims to evaluate whether low protein diet during adolescence induces hypertension related to autonomic dysfunction and dysregulation redox state in male rats. The research ethics committee approved the study under CEUA nº 4833210519. Thirty-day-old Wistar rats were fed a low protein diet (4% protein as casein) for 30 days and subsequently fed a 20.5% normal protein diet for

a 60-day recovery period (LP). Control animals (NP) were fed a 20.5% protein diet throughout life. At 120 days of age, direct measurement of arterial pressure was recorded from conscious animals and oxidative stress was evaluated. Statistically significant differences were evaluated by T-Student test. Systolic (SBP) and diastolic arterial pressure was increased in LP ( $p=0.0003$ ,  $p=0.005$ ) but heart rate was unchanged. In the spectral analysis, the LP rats showed a greater amplitude in the low frequency zone (LF) of MBP ( $p=0.035$ ). In the pulse interval, the LP group showed an increase in LF, LF/HF ratio and total variability ( $p=0.014$ ,  $p=0.048$  and  $p=0.011$ ) but the high frequency zone (HF) was similar to NP. The depressor response to the ganglionic blocker, hexamethonium (30 mg/kg, iv), was greater in the LP group ( $p=0.006$ ). The levels of protein carbonyl (PC) in the heart were decreased in LP ( $p=0.0305$ ), but the activity of catalase was lower at the LP ( $p=0.0016$ ). The levels of protein carbonyl (PC) were lower in the brainstem of LP ( $p=0.002$ ) and the superoxide dismutase and catalase activity were lower ( $p=0.044$  and  $p=0.012$ ), but the levels of reduced GSH and total glutathione were higher ( $p=0.039$  and  $p=0.038$ ). Low protein diet during adolescence leads to hypertension later in life, sustained by a greater sympathetic activity associated to a disorganization of the redox state.

ID: 5098

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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#### **EFFECT OF CO-EXPRESSING THE UREA TRANSPORT UT-A3 AND WATER CHANNEL AQP2 ON THE OSMOTIC WATER PERMEABILITY OF *LITHOBATES CATESBEIANUS* OOCYTES**

Concentrated urine production by the kidneys to maintain water balance depends on the generation of an osmolality gradient along the cortico-medullary axis and increasing the permeability of the cortical collecting duct (CCD) to water—both regulated in the presence of antidiuretic hormone ADH. The osmotic gradient is formed by reabsorbing NaCl from the water-impermeable thick ascending limb and urea from the inner medullary collecting duct (IMCD) via UT-A1 in the apical and UT-A3 in both apical and basolateral membranes of the IMCD. The augmented water permeability of the CCD occurs due to the insertion of AQP2 into the apical membrane to move water from the CCD into the more concentrated interstitium. Notably, our group showed that UT-A3 also transports water, suggesting that this protein could increase the overall water permeability of the CD epithelium. Herein, we investigated the co-expression of UT-A3 and AQP2 on osmotic water permeability (Pf) of *Lithobates catesbeianus* oocytes. We injected oocytes with cRNA encoding for mouse UT-A3, rat AQP2, UT-A3+AQP2 or H<sub>2</sub>O (control), assessed surface protein expression by biotinylation and immunoblotting and used video microscopy to compute the Pf (cm/s) of oocytes exposed to a hypotonic solution. Immunoreactive bands consistent with the molecular weight of glycosylated and unglycosylated UT-A3 and glycosylated AQP2 were detected in the surface biotinylated fractions of UT-A3, AQP2 or UT-A3+AQP2-injected oocytes. The mean Pf value of H<sub>2</sub>O-injected oocytes was significantly ( $p<0.0125$ ) lower than those of UT-A3 or AQP2-injected oocytes. Interestingly, UT-A3+AQP2-injected oocytes presented significantly higher Pf values than oocytes injected with only UT-A3 or AQP2. Thus, it is plausible that UT-A3-mediated water transport in the IMCD, along with water uptake by AQP2 in the CCD, could greatly increase water reabsorption when the ADH levels are high, as occurs in the physiological demanding conditions like dehydration.

ID: 5099

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **HOW TO STIMULATE STUDENTS DURING ONLINE CLASSES THROUGH OUR PHYSIOART PROJECT**

Nowadays, many studies have alerted us about the health problems that students have been dealing during the COVID-19 isolation period. In that scenario, educators must think about new strategies to make online classes more attractive and enjoyable. Here, we show how we made online classes more pleasant and interesting through our PhysioArt project. To motivate students in online classes, we prepared a multidisciplinary course integrating physiology, anatomy, science history, and mythology together with different art expressions. After those integrative classes, students were stimulated to remotely recreate an artwork masterpiece based on the physiology context of hydromineral balance control. Some of our students' artwork was for example the reinterpretation of "The creation of Adam" from Michelangelo Buonarroti; the students' work represents Adam eating a package of potato fries, which extra sodium stimulates osmoreceptors in the central nervous system. Thus, in this reinterpretation God is emerging from the brain (replacing the angels behind God from the original fresco painting) offering water to Adam, symbolically representing the central control of thirst. Other examples can be found in our Instagram "@fisio\_arte". PhysioArt placed our students as "the artists", stimulating their creativity, rationality, proving to be an excellent strategy to motivate them during the isolation scenario caused by COVID-19 pandemic, besides increasing their interest in learning physiology, especially considering that neuroendocrinology mechanisms are complicated. Furthermore, as suggested by many students, our online PhysioArt has helped them to diminish this lonely and stressful experience by isolation and virtual classes during this coronavirus pandemic.

ID: 5101

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **IS PHYSICAL EXERCISE ABLE TO IMPROVE COGNITIVE PERFORMANCE AND STILL PRESERVE THE ABSOLUTE CELL COMPOSITION OF MICE BRAIN DURING AGING?**

The framework about the morphophysiological implications of physical exercise (PE) on cognition has shown to be promising. Some hypotheses point to neuroprotection changes as the main effects of PE, resulting in an improvement of cognition, especially in middle-aged and in elderly individuals. However, the limitation of appropriate methods that shed light on this issue calls our attention. The isotropic fractionator (IF) has proven to be an efficient and accurate method for studying brain morphometry (Repetto et al. Front in cel Neuros, 190, 1-12, 2016). The aim of this study is to analyze the effects of PE on cognition and absolute brain cell composition from hippocampus and cerebral cortex, important brain

regions involved in memory processes. Thus, 12-month-old (middle-aged) Swiss mice, after a period of PE adaptation, will be submitted to PE swimming sessions (in rectangular glass tank 60cm deep X 45cm wide X 100cm long) in groups of 4 animals per lane, with 60 minutes of duration, 5 days a week for 4 months. Behavioral tests will be used in the pre-physical training phase to assess the cognitive status. After 4 months of physical training, the animals (16 months old – elderly) will be tested for the second time to assess the evolution of cognitive performance. They will be anesthetized with ketamine (90-120 mg/kg - intraperitoneal) and perfused in 4% paraformaldehyde. Their brains will be removed from the skull, dissected and submitted to IF. It is noteworthy that this project was conceived very close before the COVID-19 pandemic being officially decreed by the World Health Organization and it has not yet been implemented. It is expected that the weekly practice of PE by trained group will improve the cognitive performance of the mice when compared to control group (Lourenço et al. Nat med, 25: 165-175, 2019) and that the absolute brain cell composition of the former will probably remain conserved throughout aging when compared to the sedentary group.

*ID: 5102*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Federal do Espírito Santo (UFES)*

### **IMPACT OF SALT CONSUMPTION ON THE BLOOD PRESSURE OF THE INDIGENOUS POPULATION AND THE CAPITAL OF THE STATE OF ESPÍRITO SANTO**

High salt intake increases blood pressure (BP). However, the effect of sodium on BP is different in populations from different ancestors. The objective is to compare the increase in pressure due to the consumption of salt in two populations of Espírito Santo: one urban (Vitória, N=272) and of indigenous villagers in the municipality of Aracruz (N = 427). Salt consumption was estimated by the 24-hour urinary sodium excretion (Vitória) or 12-hour (Aracruz). Systolic (SBP) and diastolic (DBP) BP was measured at rest in a standardized way with an oscillometric device. The projects were approved by the CEP of UFES (resolutions nº 3123/02 and nº 328.159/13). Data were analyzed using SPSS and the statistical significance for  $\alpha$  was 0.05. The sample consisted mostly of women (53%; 51%), aged  $44 \pm 14$  and  $37 \pm 14$  years in Vitória and Aracruz, respectively. In Vitória, the sample consisted of whites (46%), browns (43%), and blacks (11%) and in Aracruz all were from an indigenous background. The estimated consumption of salt was higher ( $P < 0.05$ ) in indigenous people ( $13.7 \pm 5.9$  g/day) than in Vitória ( $10.3 \pm 4.1$  g/day/salt). We observed a linear correlation between salt intake (g/day) and SBP (mmHg) both in the population of Vitória ( $SBP = 0.98 \times \text{salt} + 111$ ;  $r = 0.25$ ;  $P < 0.01$ ) and in the indigenous population ( $SBP = 0.29 \times \text{salt} + 117$ ;  $r = 0.08$ ;  $P < 0.08$ ). Regarding DBP, also in Vitória, the increase was greater than in Aracruz (0.45 vs. 0.33 mmHg/g salt-day). The data show that although the indigenous population has a higher salt intake, the effect of this nutrient on BP, especially on SBP, is much smaller than in the population of Vitória. This lower pressure sensitivity to salt consumption could explain, in part, the lower prevalence of arterial hypertension in this indigenous population.

*ID: 5105*

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### RELATION BETWEEN OBESITY AND GHRELIN IN RATS SUBMITTED TO ENDOTOXEMIA

Obesity is related with occurrence of sepsis, characterized by an unregulated immune response. In obese people, the hormone ghrelin exerts regulatory actions in the inflammatory response and is in lower concentration in the blood. We suggest that ghrelin has an action in regulating the immune system during endotoxemia and that obesity reduces the expression of its receptor (GHSR-1a), exacerbating the pro-inflammatory response. The aim was to evaluate the relationship between obesity and ghrelin in a model of endotoxemia. The project was approved by CEUA (nº2013.1.835.53.0). Twenty-eight 45-day old Wistar Hannover rats weighing approximately 200g were used. The animals received cafeteria diet (CD) or rodent chow for 10 weeks, after this period they were treated with lipopolysaccharide (LPS) or saline and evaluation of serum ghrelin concentration and hepatic expression of GHSR-1a was performed. The animals in the CD group when compared to the animals that received chow showed higher mean weight gain at the end of the experiment ( $488.9g \pm 41.1g$  vs.  $142.2g \pm 20.6$ ,  $p=0.001$ ). Animals in the CD + Saline group has lower plasma ghrelin concentration when compared to the Ration + Saline animals ( $37.35 \pm 9.31pg/ml$  vs.  $71.17 \pm 28.07pg/ml$ ;  $p=0.002$ ). No effect of LPS treatment was observed on plasma ghrelin concentration ( $55.37 \pm 14.24pg/ml$  vs.  $72.54 \pm 17.98pg/ml$ ;  $p>0.05$ ). As for the hepatic expression of the GHSR-1a receptor, no significant differences were identified when comparing the groups. However, a trend of reduced expression of the GHSR-1a receptor was noted in the animals of the CD group. A Study points that ghrelin has the potential to improve organ injury associated with sepsis, resulting in suppression of inflammation (Mol. Med. Rep. 19:5424,2019). It is concluded that obesity results in decreased plasma concentration of ghrelin impacting the inflammatory response. Future studies could evaluate the role of ghrelin in the inflammatory response in obese and non-obese individuals.

ID: 5106

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### VASCULAR EFFECTS OF FEMALE WISTAR RATS EXPOSURE TO TOPIRAMATE DURING ADOLESCENCE: SHORT AND LONG-TERM EVALUATION OF ENDOTHELIAL FUNCTION AND THE ROLE OF ESTROGEN RECEPTORS $\alpha$ AND $\beta$

Topiramate (TOP) is a drug approved for epilepsy treatment and migraine prophylaxis in adolescents. It has been reported that TOP treatment can increase cardiovascular risk factors. However, at least in females, the acute and late repercussions of TOP exposure during adolescence on the vascular system have not been investigated yet. Moreover, the possible involvement of female sex hormones on these vascular repercussions is not known. Thus, the present study aimed to evaluate if female

exposure to TOP during adolescence can influence the vascular response and the role of estrogen receptors  $\alpha$  and  $\beta$  in this response. For this, female Wistar rats were exposed to TOP (41 mg/kg/day) or water by gavage from postnatal day (PND) 28 to 50. At the PND 51 and 90 (estrus phase), thoracic aorta reactivity to the phenylephrine (Phenyl) and acetylcholine (ACh) was evaluated in the presence (E+) or absence of endothelium (E-). Also, TOP aortic rings E+ were incubated with  $\alpha$  (MPP) and  $\beta$  (PHTPP) estrogen receptors antagonists 30 minutes before the concentration-response curves. Groups were compared by the maximum response (maxR) for each drug and analyzed by two or one-way ANOVA, Kruskal-Wallis, or test t. (n=5-12/group) (CEUA:100/2018). The response to Phenyl (grams) in aortic rings E+ and E- was similar between CTR and TOP at PND 51 and 90. Similarly, there was no difference between CTR and TOP in the maxR (%relaxation) to ACh in both periods. Moreover, incubation with MPP+PHTPP [ $1.63 \pm 0.14$ ] did not change maxR to Phenyl [ $1.71 \pm 0.10$ ] at DPN 51 nor 90 [no incubation:  $1.66 \pm 0.25$ ; MPP+PHTPP:  $1.85 \pm 0.32$ ]. Similarly, the maxR to ACh [ $93.50 \pm 2.10$ ] was not altered by the estrogen receptor antagonists [ $9.07 \pm 1.14$ ] at DPN 51 and 90 [no incubation:  $88.80(81.37-94.16)$ ; MPP+PHTPP: $90.94(82.15-94.75)$ ]. In conclusion, the exposure of female rats to TOP during adolescence does not alter the aortic response, nor the estrogen receptors endothelial modulation in the contractile and relaxant response.

ID: 5109

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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## EVALUATION OF THE NUTRIGAME GAME - YOUR FOOD GUIDE AS A COMMUNICATION STRATEGY FOR THE FOOD GUIDE FOR THE BRAZILIAN POPULATION

Amongst Brazilian adolescents, overweight prevalence is 20%. The dietary pattern of this group, consisting of high consumption of ultra-processed foods and low consumption of in natura foods, contributes to this scenario. Thus, the digital game, NutriGame – your food guide, was developed in order to communicate the guidelines of the Food Guide for the Brazilian Population to the adolescent public. This work evaluated the effectiveness of the game in communicating the Brazilian food guidelines. 38 adolescents, between 11 and 17 years-old, participated in the study. They answered a food questionnaire that addressed issues of perception, self-efficacy, knowledge and eating attitude, before and after playing the NutriGame for 14 days. At the end of this period, they also answered an immersion questionnaire. The scores of each questionnaire were calculated to compare the results before and after using the game. After playing the NutriGame, teenagers improved their perception of healthy eating. On a scale from 0 to 10, they said they knew more about this topic after playing (Pre  $7.05 \pm 1.83$ ; Post  $7.94 \pm 1.33$ ,  $p=0.025$ ) and considered their eating healthier (Pre  $6.50 \pm 1.64$ ; Post  $7.16 \pm 1.11$ ,  $p=0.017$ ). They also increased knowledge about healthy eating, which was demonstrated by the increase in the knowledge score (Pre  $27.82 \pm 1.65$ ; Post  $29.05 \pm 1.45$ ,  $p=0.0001$ ). Adolescents' self-efficacy also improved: at the pre time, the score for intention to change habits was  $43.47 \pm 4.90$  increasing to  $47.05 \pm 3.36$  after using the game ( $p<0.0001$ ). They also showed improvement in eating attitude (Pre  $20.58 \pm 3.19$ ; Post  $22.53 \pm 3.12$ ,  $p=0.0001$ ). The average immersion in the game was  $27.25 \pm 3.36$  points, which demonstrates high involvement with the narrative. The digital game NutriGame - your food guide is effective in communicating the Food Guide to teenagers.

ID: 511

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### TRPM2 INHIBITION PROMOTES PROTECTIVE EFFECTS IN PARKINSONIAN MICE

Recently, the transient receptor potential melastatin 2 (TRPM2), a non-selective calcium channel, has been shown to mediate neurodegenerative process in ischemia, Alzheimer's disease, and bipolar disorder. However, there is a lack of studies evaluating the role of this channel in Parkinson's disease (PD). In addition, the compound AG490, capable of inhibiting TRPM2 activity, elicited beneficial effects in neonatal hypoxic-ischemic injury animals. In this way, the inhibition of TRPM2 through AG490 could also promote neuroprotection in an animal model of PD. To evaluate this, we conducted experiments in C57/BL male mice with 3 months of age (27-30g). All protocols were approved by CEUA (nº 8395080450). First, AG490 or vehicle were intraperitoneally administered. After 20 min, 1µl of 6-hydroxydopamine (6-OHDA, 10µg) or saline were administered in right striatum (CPu). Motor behavior were evaluated 6, 13 and 20 days after the surgery through cylinder test and apomorphine induced rotational test (n=10-11/per group). Substantia nigra was collected for immunohistochemistry (n=4-5/per group) in day 7. Data were analyzed by Two-way ANOVA and Bonferroni's pos-test when appropriate (p<0.05). Our results indicated that TRPM2 is upregulated in PD model (+197%, p<0.01). In addition, AG490 was able to prevent dopaminergic loss as an increase of 64±2% (p<0.01) of tyrosine hydroxylase (limiting enzyme of dopamine synthesis) was observed when compared AG490-treated 6-OHDA animals with vehicle-treated 6-OHDA animals. The compound also improved motor deficiency as asymmetric use of forelimbs was restored to control values in cylinder test, and number of asymmetric rotations was reduced by 44±2% (p<0.01) in AG490-treated 6-OHDA animals. In conclusion, inhibition of TRPM2 promotes neuroprotection in a PD animal model. These findings can be useful in future studies for the establishment of new therapeutic strategies for PD patients.

ID: 5112

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal da Bahia (UFBA)

### GALACTAGOGICAL ACTIVITY OF ETHANOLIC EXTRACT FROM *VALERIANA OFFICINALIS* LINN AND ITS DICHLOROMETHANE FRACTION IN EXPERIMENTAL ANIMAL MODEL

*Valeriana officinalis* L. is a sedative medicinal plant commonly used by lactating women to treat anxiety states during breastfeeding. This is the first report that evaluated the galactagogue activity of the ethanolic extract of *V. officinalis* roots (EEVO) and its dichloromethane fraction (DF) in an experimental

animal model. This study was approved by the Ethical Committee for Animal Research of the Federal University of Bahia (Nº 063/201 8). Lactating Wistar rats (250-300g), (n = 6) were treated during 1 7 days of lactation with distilled water, EEVO or DF. The litter and lactating rats weight, the estimated milk production and breastfeeding time were evaluated. Proteins, triglycerides, cholesterol and lactose were determined in milk by colorimetric assays. Histological analysis of the mammary glands (MG) and Prolactin concentration on MG, serum and pituitary gland were determined by ELISA. EEVO and DF (25 and 50 mg/kg) showed increased total weight gain of pups, higher concentrations of total proteins and triglycerides in milk, and increased numbers of lobules and decreased alveolar epithelial cells in the involution phase in MG. EEVO 50 mg/kg increased concentrations of prolactin in serum and mammary gland. Valerian has galactagogue activity in vivo, increasing prolactin levels, probably due to steroidal compounds with estrogenic activity in its composition. However, further studies must be carried out to elucidate the mechanisms of action and bioactive compounds, as well as, to guarantee its safe use as a galactagogue phytotherapeutic by lactating women.

*ID: 5113*

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER - Prêmio Álvaro*

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*Instituições: Universidade Federal do Rio de Janeiro (UFRJ)*

### **MEGALIN-MEDIATED ALBUMIN ENDOCYTOSIS IN PROXIMAL TUBULE EPITHELIAL CELLS IS A TARGET FOR B2 RECEPTOR-MEDIATED BRADYKININ**

Megalin-mediated albumin endocytosis plays a central role in albumin reabsorption in proximal tubule epithelial cells (PTECs). Evidence has shown that bradykinin (BK) modulates proteinuria. However, the potential effect of BK on albumin endocytosis has not been investigated yet. We aimed to verify if BK can modulate megalin-mediated albumin endocytosis in PTECs and the molecular mechanism involved. LLC-PK1 cells, a porcine PTEC line were used. When indicated LLC-PK1 cells were incubated overnight with BK. BK at 10<sup>-7</sup>M decreased albumin endocytosis by 40% (n=4), assessed by albumin-FITC and DQ-albumin uptake. Using immunoblotting and immunofluorescence microscopy, it was observed that BK did not change total megalin expression (n=3). To investigate if the inhibitory effect of BK on albumin endocytosis involves changes in megalin trafficking, cells were transfected with megT0-HA (megalin construct encoding megalin intracellular domain). Using confocal analysis, we observed that BK significantly reduced megT0-HA on cell surface without changes total megT0-HA expression (n=3). In addition, megT0-HA co-localized with EEA1+ endosomes, an early endosome marker, but not with LAMP-1+ lysosomes (n=3). Next, we investigated the molecular mechanism involved in this process. HOE-140 10<sup>-7</sup>M (a B2R antagonist), but not 10<sup>-7</sup>M DALBK (a B1R antagonist), abolished the inhibitory effect of BK on albumin endocytosis (n=4). In agree, 10<sup>-7</sup>M Lys-BK (a B2R agonist), but not 10<sup>-7</sup>M Lys-DABK (a B1R agonist), inhibited albumin endocytosis (n=3). Regarding intracellular pathways, BK increased PKC activity by 3-fold (n=5). Moreover, 10<sup>-8</sup>M calphostin C (a PKC inhibitor) abolished the inhibitory effects of BK on albumin endocytosis (n=4) and megT0-HA surface expression (n=4), while PMA (a PKC activator) mimicked it. (n=4) Altogether, our data shows that BK inhibited megalin-mediated albumin endocytosis through the activation of B2R/PKC pathway.

*ID: 5114*

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER*

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### **HOST IMMUNE RESPONSE PARTICIPATES IN MALARIA ACUTE KIDNEY INJURY: ROLE OF CD8+ T CELLS**

Severe malaria is attributed to *Plasmodium falciparum* infection and entails different pathologies caused directly by parasite infection and host immune response. Malaria acute kidney injury (MAKI) is characterized by glomerular and tubular damage. This process is attributed to oxidative stress and obstruction of renal microvasculature by aggregates of parasitized erythrocytes. Overactivation of the host immune response is also postulated, however its precise role in MAKI is still unknown. The objective of the work was to evaluate the participation of T cells in MAKI pathogenesis. For this, we performed adoptive transfer of splenocytes-derived T cells from C57Bl6 mice infected with *P. berghei* ANKA to healthy acceptor animals (008/18). Renal function as well as homing and immune response were assessed. Adoptively transferred T cells induced proteinuria (2-fold) and increased UPCr (protein and creatinine ratio; 2.3-fold). Markers of glomerular injury, creatinine clearance, plasma creatinine and plasma urea, did not change. However, we observed an increase in gamma GT activation in urine (1.6-fold), a marker of renal tubular damage. These results indicate that malaria-responsive T cells induce renal tubular damage without glomerular involvement. Accordingly, there was a remarkable increase in T cell homing to the kidneys, as well as spleen and brain. Moreover, we observed increase in renal proinflammatory cytokines INF $\gamma$  (2-fold), IL-17 (1.3-fold) and IL-6 (1.5-fold). FACS analysis revealed an increase in the frequency of CD8 T cells in the kidney, which was accompanied by increased expression of perforin in the renal cortex (1.7-fold). These results indicate that CD8 T cells are activated during malaria infection and can migrate to the kidney besides brain and spleen. In the kidney, perforin production has a role in inducing renal tubular damage. This work adds new insights into the pathogenesis of MAKI describing it as a consequence of host exacerbated immune response.

*ID: 5115*

*Área: Fisiologia Geral*

*Forma de Apresentação: Ê-POSTER*

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### **EVALUATION OF THE BIOLOGICAL ACTIVITIES OF THE ASSOCIATION OF B-CARYOPHILLENE AND DOCOSAHEXANOIC ACID IN EXPERIMENTAL MODELS**

Sepsis and cancer are diseases that have in common high levels of oxidative stress, high rates of morbimortality and high costs to health institutions. Natural products have been evaluated for the ability to fight against that, such as  $\beta$ -caryophyllene (BCP) and Docosahexanoic Acid (DHA). To evaluate the biological activities of the BCP-DHA association experimental models of analgesia, inflammation,

infection, oxidative stress and neoplasia were realized. The analgesic effects were evaluated in animal models through abdominal writhing induced by acetic acid, paw edema induced by intraplantar injection of formalin and hypernociception with increasing pressure in the paw. To determine the anti-inflammatory effects, neutrophils and monocytes isolated from human peripheral blood were infected with *Staphylococcus aureus* and incubated with treatment, for subsequent cytokine dosing and gene expression analysis. The antioxidant capacity was evaluated by the DPPH method. And the antitumor effects, with malignant breast and prostate cell lines and normal lineages control cells, will be studied using mtt cell viability assay, nuclear fragmentation, cell migration and cell invasion. Analgesic effects were observed in all models performed, when comparing the control (saline) and treated groups with BCP-DHA (5 mg / kg), obtaining statistical significance with  $p < 0.0022$  in the test of abdominal writhings induced by acetic acid;  $p < 0.022$  in the evaluation of flinches and paw licks in the period of 5-30 minutes in the intraplantar formalin injection model; and  $p < 0.0041$  in the hypernociception of the von Frey test. In the DPPH test only BCP alone had an antioxidant effect. Thus, BCP-DHA association shown to have a potent analgesic effect in different models of nociceptive evaluation, increasing the resistance of the animals to the pain stimulus.

ID: 5116

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **IMUNOMODULATORY POTENTIAL OF SEVOFLURANO IN RELATION TO PROPOFOL IN SEPSIS MODEL**

Sepsis is worldwide health burden. Usually, septic patients are submitted to chirurgic procedures where anesthetics agents are needed. Our aim is to understand the effects of sevoflurane (SEVO) and propofol (PROP) on lung structural cells, phagocytic capacity macrophages/monocytes, neutrophils migration and inflammatory genes expression, in sepsis model (CEUA 027/17). Nine Wistar male rats were subjected to cecum ligation procedure (CLP) for sepsis induction. After 48h, animals were euthanized. Macrophages and neutrophils from blood and bronchoalveolar lavage fluid (BALF) as well as lung epithelial and endothelial cells were primarily extracted. Cells were exposed, for 1h, to: 1) one mean alveolar concentration of SEVO; or 2) 50  $\mu\text{M}$  of PROP (clinical used concentration); or 3) control (CTRL). Macrophages phagocytic capacity and neutrophils migration induced by interleukin (IL)-8 gradient were evaluated. IL10, IL6, IL1 $\beta$  and TGF $\beta$  mRNA levels were measured by RT-PCR in macrophages. IL1 $\beta$ , TNF $\alpha$  and cell receptors associated to retention (CXCR4) and mobilization (CXCR2) mRNA levels were also measured in neutrophils. Zona ocludens (ZO)1 and surfactant protein (SP)B were measured in epithelial cells. Toll like receptor (TLR)4 was measured in endothelial cells. Blood monocytes phagocytic capacity and IL-10 were higher in SEVO than PROP group ( $p=0.0006$ ,  $0.02$  respectively), while presented reduced IL-6 and IL1  $\beta$  mRNA levels ( $p=0.04$ ,  $0.01$  respectively). CXCR2 and IL1 $\beta$  were lower in blood ( $p=0.03$ ,  $0.09$ , respectively) and BALF ( $p=0.02$ ,  $0.001$ , respectively) neutrophils, while CXCR4 mRNA levels were higher ( $p=0.001$ ) after SEVO exposure. Both SEVO and PROP increased ZO-1 ( $p=0.02$ ,  $0.04$  respectively), and reduced SP-B in epithelial cells and TLR4 in endothelial cells. In conclusion, SEVO enhanced macrophages phagocytic capacity and reduced inflammatory markers compared to PROP. During the early sepsis course, brief exposure to SEVO showed protective effects compared to PROP.

ID: 5117

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **LOSARTAN IMPROVES THE CARDIOVASCULAR PROFILE IN RATS WITH INSULAR STROKE**

Stroke, a cerebrovascular disease, is the second leading cause of death in the world. Patients who survive stroke present physiological alterations. In this regard, damage to the insular cortex, results in marked sympathetic-mediated increase in baseline heart rate, cardiac molecular changes and arrhythmias. Therefore, investigating strategies that can alleviate post-insular stroke consequences becomes extremely relevant. Evidence indicates that the renin-angiotensin system (RAS) peptides interact with the sympathetic nervous system. Here, we evaluated the effect of AT1 receptor blockade on cardiovascular changes generated from experimental hemorrhage (ICH) at the intermediate region of the insular cortex (iIC). Wistar rats were anesthetized and prepared for unilateral injection of blood (ICH iIC; n=6) or vehicle (saline 200 nl, Sal iIC; n=6) at the iIC and for recording of cardiovascular variables (mean arterial pressure, MAP; heart rate, HR) (CEUA UFMG 112/2019). Just after ICH, separated groups of rats (n=6 each) were submitted to three days of treatment (single daily i.p. dose) of losartan (los; AT1 antagonist, 10 mg/kg) or vehicle (control; NaCl 0.9%, 0.1ml /100g). The ICH iIC group showed an elevated baseline HR ( $422 \pm 10$  bpm) when compared to the Sal iIC group ( $365 \pm 6$  P<0.01) without significant changes in baseline MAP. In ICH iIC rats, treatment with los i.p. restored HR to baseline levels and decreased baseline blood pressure values when compared with ICH iIC rats treated with vehicle i.p. (HR: los  $358 \pm 7$  vs vehicle  $428 \pm 10$  bpm P<0.01; MAP: los  $99 \pm 2$  vs vehicle  $111 \pm 2$  mmHg P<0.01). The present data suggests that AT1 receptors blockade may reduce the impact of cardiac sympathetic activity exacerbation observed after ICH at iIC, as well as promoting a protective reduction in baseline blood pressure values. The present study clearly suggests that immediate treatment with losartan can minimize cardiovascular risk after insular stroke.

ID: 5119

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### **MATERNAL HIGH-FAT DIET IMPAIRS GENE EXPRESSION AND MORPHOLOGY OF ADIPOSE TISSUE IN EARLY LIFE, HYPERLEPTINEMIA MAY LINK WAT WITH BAT DYSFUNCTION**

The adipose tissue has great plasticity and participates in several physiological processes, including energy storage, hormonal secretion and thermogenesis. Perinatal nutrition has been shown to lead to dysfunctional adipose tissue in adulthood. In this study, we investigated the effects of high-fat maternal nutrition on adipose tissue development. Female Sprague Dawley rats were divided into 2 groups: control normal fat (12% fat - NFD - N=6), or high-fat diet (43% fat - HFD - N=6), from 3 weeks before mating until postnatal day 10 (PN10), when pups were weighed and euthanized. Subcutaneous white

adipose tissue (WAT) and interscapular brown adipose tissue (BAT) were collected for gene expression and histology analysis. In PN10, HFD offspring showed an increase in body fat mass, glycemia and leptinemia. HFD pups presented increased leptin gene expression ( $p < 0.05$ ) and larger adipocytes in WAT ( $p < 0.01$ ). BAT adipocytes did not change in size, but lipid-droplet positive within BAT were larger in HFD than in NFD ( $p < 0.05$ ). Maternal HFD decreased gene expression for PPAR- $\gamma$ , PPAR- $\alpha$ , PRDM16 and Leptin receptor ( $p < 0.05$ ) in BAT. The present data reinforces the negative effects of perinatal HFD consumption on offspring adipose tissue development. Early hyperleptinemia may lead to interscapular BAT leptin resistance, linking WAT hypertrophy and increased leptin content to BAT altered gene expression and remodeling in a positive energy balance early in life, which may increase long-term susceptibility to adipose tissue dysfunction.

ID: 5123

Área: *Fisiologia Celular*

Forma de Apresentação: *Ê-POSTER*

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### **KELCH-LIKE PROTEIN 33 MAY REGULATE CELL CYCLE**

Kelch-like proteins (klhl), belonging to Kelch superfamily, have been involved in skeletal muscle diseases or cancer development, among others. However, little is known about many of its members such as kelch-like protein-33 (klhl33). We previously reported that klhl33 could promote cell proliferation and its depletion produced changes in cell morphology consisting of bigger sized and bi-nucleated cells with dislocation of Ecadherin and  $\beta$ -actin in cytoplasmic-stress fibers (1). The aim of this study was to deepen the knowledge about the possible functions of klhl33. For this purpose, in NMuMG cells we determined: i) klhl33 cell localization by immunocytochemistry assay, ii) klhl33 protein abundance in synchronized cells at the different stages of cell cycle by western blot, and iii) the time required for completing a single mitosis in either control or klhl33-depleted cells with chromosomes marked with the red fluorescent fusion protein H2B-mCherry by time lapse imaging. Student's t test was used ( $p < 0.05$ ;  $n = 3$ ). Our results show that klhl33 protein was localized at the cytoplasm of cells, its abundance is increased in synchronized cells at G1 ( $1.57 \pm 0.01$  vs  $1 \pm 0.012$ , in arbitrary units) and at M ( $1.80 \pm 0.011$  vs  $1 \pm 0.013$ , in arbitrary units) phases and, klhl33 depleted cells shows highly prolonged abnormal mitosis and a subsequent formation of one bigger and bi-nucleated cell. As far as we know, this is the first study demonstrating that klhl33 may have a function in cell cycle regulation.

ID: 5124

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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Instituições: *Universidad de Sevilla*

## SHORT-TERM MEMORY CHANGES THOROUGH CHRONIC COLITIS DEVELOPMENT IN RATS

Inflammatory bowel disease is a chronic pathology characterized by recurrent periods of intestinal inflammation and some patients also develop alterations in the nervous system, such as depression, anxiety or cognitive deficits. The aim of this work was to investigate whether our experimental model of ulcerative colitis in rats induces memory alterations. For this purpose, 30-day-old male rats were used and chronic colitis was induced by administering 5% sodium dextran sulfate (DSS) in drinking water during 3 cycles consisting of 7 days DSS - 7 days water. Control rats drunk normal tap water. Rats were handled and sacrificed according to European (2010/63/UE) and Spanish (BOE 34/11370, 2013) normative. Project: CEEA-US2019-2/3, 15/01/2020/001. Clinical, macroscopic and histological alterations of the colon were evaluated to assess colitis severity throughout the DSS-treatment. IL-1 $\beta$  and TNF $\alpha$  mRNAs abundance was determined in colon and hippocampus by real time PCR. The analysis of short-term memory was carried out using the "novel object recognition test". Student's t test was used ( $p < 0.05$ ;  $n = 8$ ). Our results show that chronic colitis and neuroinflammation in hippocampus were developed as IL-1 $\beta$  and TNF $\alpha$  mRNAs abundance increased compared with control rats. Discrimination index was reduced after each week of DSS treatment:  $58.2 \pm 1$  % vs  $47.9 \pm 2$  % after the first week,  $61.9 \pm 8$ % vs  $44.2 \pm 5.1$ % after the second week and  $70.7 \pm 0.3$  % vs  $46.3 \pm 2$  % after the third week. Indicating that rats show short-term memory alterations as colitis develops. We conclude that DSS-induced chronic colitis decreased short-term memory and it could be due to the neuroinflammation produced in the hippocampus.

ID: 5125

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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## SYMPATHETIC CONTROL DYSFUNCTION IN JUVENILE RATS EXPOSED TO POST-NATAL INTERMITTENT HYPOXIA

Exposure to post-natal chronic intermittent hypoxia (pCIH) is a risk factor for developing cardiorespiratory diseases in adulthood. We previously showed that pCIH causes respiratory instability and motor dysfunction that persist until adult life. In this study, we investigated the impact of pCIH on the sympathetic control of arterial pressure in juvenile animals. Neonate male Holtzman rats were exposed to pCIH (6% O<sub>2</sub> for 30 s, every 10 min, 8 h/day) during their first 10 days of life, while control animals were maintained under normoxia. In early adult life (P25-40), freely behaving pCIH animals ( $n = 23$ ) exhibited elevated baseline arterial pressure levels linked with augmented power of low-frequency, sympathetic-related modulation of systolic arterial pressure when compared to control animals ( $n = 12$ ,  $P < 0.05$ ). Using decerebrated, arterially perfused in situ preparations, we found that rats previously exposed to pCIH exhibited a two-fold increase in baseline levels of thoracic sympathetic activity ( $n = 15$ ) and elevated firing frequency of presympathetic neurons in the rostral ventrolateral medulla (RVLM,  $n = 7$ ) compared to control rats ( $n = 6-7$ ,  $P < 0.05$ ). We also verified that pCIH rats ( $n = 5$ ) presented augmented expression of mRNA for HIF-1 $\alpha$  (hypoxic inducible factor) in RVLM catecholaminergic neurons (C1 cells). The expression of this transcription factor was low in C1 neurons of control rats ( $n = 5$ ,  $P < 0.05$ ). Our data indicate that neonatal rats exposed to pCIH exhibit elevated arterial pressure levels and sympathetic overactivity. The elevated expression of HIF-1 $\alpha$  in the RVLM of pCIH rats is a potential mechanism driving plastic changes in the presympathetic neurons resulting in increased sympathetic activity and

high blood pressure.

ID: 5127

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER - Prêmio Álvaro

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### INHALED NINTEDANIB NANOCRYSTAL THERAPY REDUCED LUNG FIBROSIS IN EXPERIMENTAL SILICOSIS

Silicosis is an irreversible pneumoconiosis caused by continuous inhalation of crystalline silica microparticles. The tyrosine kinase inhibitor Nintedanib (NTB) inhibits key signaling pathways involved in silicosis progression, being a potential therapeutic alternative. To minimize adverse effects resulting from NTB systemic exposure, we engineered an inhalable NTB nanocrystal formulation (NTB-NS), that enhances lung pharmacokinetics while reducing dosing frequency. A wet-milling process was used to develop the NTB-NS with Pluronic F127 coating (particle size ~330nm), resulting in a formulation resistant to aerosolization, that overcomes lung biological barriers, and presents physiological stability. We then evaluated preclinical safety, by dosing healthy C57BL/6 mice (male, 10-12 w/o) with NTB-NS (0.01, 0.1 and 1 mg NTB/kg) via intratracheal instillation. Last, we investigated whether locally administered NTB-NS was capable of attenuating the fibrotic process in a murine silicosis model, compared to the conventional once-daily systemic treatment with NTB esylate (NTB-Esy, 100 mg NTB/kg). This animal study was approved by the local animal committee (protocol nº157/19). NTB-NS did not elicit acute adverse events in healthy mouse after intratracheal instillation – body temperature and weight remained unchanged while lung inflammation was not observed, regardless of the dose tested. When compared to NTB-Esy (100 mg/kg), NTB-NS (1mg/kg) presented a remarkable anti-fibrotic activity in the current silicosis model, including a significant reduction in fractional area occupied by granulomas in the lung tissue (Sham: 33.7%±15.3, NTB-Esy: 38.8%±3.0, NTB-NS:5.7%±5.0), collagen deposition in granulomas (Sham: 24.17%±1.0, NTB-Esy: 25.6%±5.8, NTB-NS: 12.1%±0.8), and static lung elastance (Sham: 29.9±4.7 cmH<sub>2</sub>O, NTB-Esy: 29.7±5.8 cmH<sub>2</sub>O, NTB-NS: 25.7±2.4 cmH<sub>2</sub>O). The development of nintedanib nanocrystal inhaled formulation may be a promising strategy for silicosis treatment.

ID: 5129

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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Instituições: Universidad de Sevilla

## CHRONIC COLON INFLAMMATION INDUCES BEHAVIOUR ALTERATIONS IN RATS

We previously reported that colon acute inflammation increases excitability of rat pyramidal neurons of motor cortex (1). The aim of the present study is to investigate whether chronic colitis induced in rats produces behaviour alterations. For this purpose, 30-day-old male rats were used and chronic colitis was induced by administering 5% sodium dextran sulfate (DSS) in drinking water during 3 cycles consisting of 7 days DSS - 7 days water. Control rats drunk normal tap water. Rats were handled and sacrificed according to European (2010/63/UE) and Spanish (BOE 34/11370, 2013) normative. Project: CEEA-US2019-2/3, 15/01/2020/001. Clinical, macroscopic and histological alterations of the colon were evaluated to assess colitis severity. IL-6 and iNOS mRNAs abundance was determined in colon and cerebral cortex by real time PCR. The analysis of the animal behaviour was carried out using the "open field test". One-way ANOVA followed by Tukey's test was used ( $p < 0.05$ ) ( $n = 8$ ). Our results show that chronic colitis and neuroinflammation in cerebral cortex were developed as IL-6 and iNOS mRNA abundance increased compared with control rats. All the behaviour parameters measured changed thorough colitis develops and, after the third week of DSS treatment, when a chronic colitis is established, we found that DSS-treated rats showed a decrease in the time spent within the center of the cage ( $7 \pm 0.7$  vs.  $1.6 \pm 0.5$ ) and in the number of groomings ( $3 \pm 0.1$  vs.  $0.9 \pm 0.3$ ) which indicate anxiety-like behaviour, and also a decrease in horizontal motor activity by increasing the immobility time ( $2.3 \pm 0.3$  vs.  $33 \pm 7$ ) and in vertical motor activity by decreasing the number of rearings ( $33.5 \pm 2$  vs.  $12 \pm 2$ ). We conclude that DSS-induced chronic colon inflammation increased anxiety and reduced motor activity and it could be due to the neuroinflammation produced in cerebral cortex.

*ID: 5130*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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## REDUCTION OF THE AMPLITUDE OF P300 POTENTIAL SUBCOMPONENTS AS AN IMPLICATION OF COGNITIVE DEFICIT IN FIBROMYALGIA WOMEN

Fibromyalgia, an idiopathic syndrome of diffuse chronic musculoskeletal pain, affects mostly women. In addition to the painful condition, there are neural dysfunctions that induce cognitive alterations in attention and memory. Thus, the Event-Related Potentials (ERP) technique is used as a non-invasive means in the cognitive functional assessment of this audience. Furthermore, in the attention analysis of fibromyalgia, the P300 deformation subcomponents are used: P3a aimed at passive, decentralized, multifocal and momentary attention; and P3b to memory and active and selective focus. This observational cross-sectional case-control study approved by the Ethics Committee with CAAE - 97669018.6.0000.5546/2.897.520, aimed to evaluate the amplitude of both subcomponents of 40 volunteer women: 20 with a clinical diagnosis of fibromyalgia ( $45.6 \pm 11.7$  years) and 20 healthy ( $45, 4 \pm 11.07$  years). Data were collected through the Electroencephalogram (EEG) exam, with a sampling rate of 200 Hz, in three specific regions, Fz, Cz and Pz (frontal, central and parietal), described in microvolts during classical auditory stimulation P300. In the Shapiro Wilk normality test, it was found that the data did not present a normal distribution, therefore, it was necessary to carry out comparisons through the non-parametric test for two independent samples by Mann Whitney. The results of this study exposed reduced amplitudes in fibromyalgia in all investigated regions; P3a: Fz ( $Z = -2.814$ ,  $p < 0.005$ ), Cz ( $Z = -3.071$ ,  $p < 0.002$ ) and Pz ( $Z = -3.003$ ,  $p < 0.003$ ), and P3b: Fz ( $Z = -2.963$ ,  $p < 0.003$ ), Cz ( $Z = -2.286$ ,  $p < 0.022$ )

and Pz ( $Z=-2.922$ ,  $p<0.003$ ). The findings suggest changes in basic and multicentric cognitive processing (P3a), as well as in specific and selective (P3b), indicating a lower rate of neuronal recruitment to the development of such intellectual abilities; a fact possibly arising from states of hyperalgesia, allodynia and central sensitization, commonly associated with this population.

ID: 5131

Área: *Fisiologia de Órgãos e Sistemas: Digestória*

Forma de Apresentação: *Ê-POSTER*

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Instituições: *Universidade Federal do Ceará (UFC)*

### **GASTROINTESTINAL EFFECTS OF CHRONIC NANDROLONE DECANOATE TREATMENT AND TREADMILL EXERCISE IN RATS**

Anabolic-androgenic steroids abuse, associated or not with physical exercise, cause notable side effects. Now, we studied the effect of nandrolone decanoate (ND) treatment and treadmill exercise on gut motility in male Wistar rats ( $\approx 220$ g) subjected to sedentary control (SC), trained control (TC), sedentary nandrolone (SN) or trained nandrolone (TN) protocols ( $n=7$  each). Treated groups received ND (5mg/kg, i.m.) 2 days/week for 8 weeks. Controls received only vehicle. Rats were adapted to treadmill exercise over 10 days (5m/min, 5min/day) and then exercised rats were submitted to running sessions at 60% of maximum speed, 5 days/week for 8 weeks. Sedentary rats run 5 min, once a week at 5 m/min. We evaluated gastric emptying (GE) via  $^{13}C$  breath test at days 0, 3, 7, 14, 28, 42 and 56. At last, we measured intragastric pressure and in vitro contractility of antrum, fundus and duodenum (CEUA 3507130618). After Shapiro-Wilk test, data were compared by ANOVA (Tukey's posthoc) or Kruskal-Wallis' tests (Dunn's posthoc). ND accelerated liquid GE from day 28 (SN  $32.1\pm 1.6$ ; TN  $33.2\pm 2.6$  vs. SC  $37.1\pm 2.7$ min) until day 56 (SN  $32.6\pm 1.5$ ; TN  $33.4\pm 2.4$  vs. SC  $38.2\pm 1.7$ min). GE of solids of SN rats accelerated on day 3 ( $116.3\pm 14.8$  vs. SC  $90.8\pm 11.4$ min); and at day 56 both ND-treated groups showed faster solid GE (SN  $85.0\pm 9.3$ ; TN  $92.3\pm 11.8$  vs. SC  $112\pm 13.8$ min). Exercise reduced frequency (TC  $2.4\pm 0.07$ ; TN  $2.5\pm 0.07$  vs. SC  $4.4\pm 0.07$ cpm) and increased amplitude of gastric contractions (TC  $30.7\pm 1.4$ ; TN  $31.6\pm 1.2$  vs. SC  $3.7\pm 0.14$ mmHg). SN rats display more subtle enhancement of gastric amplitude ( $7.7\pm 0.4$ mmHg). SN group showed enhanced carbachol responsiveness of gastric fundus ( $7979\pm 535$  vs. SC  $5391\pm 387$ ) and duodenum strips ( $2724\pm 162$  vs. SC  $2059\pm 65$ ), as well as impaired duodenal sodium nitroprusside-induced relaxation ( $1111\pm 118$  vs. SC  $1679\pm 57$ ). In conclusion, ND has a great impact in gut motor function probably due to higher excitability of muscarinic receptors and impairment of NO relaxation pathway.

ID: 5134

Área: *Fisiologia Celular*

Forma de Apresentação: *Ê-POSTER*

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### MITOCEPTION: A STRATEGY TO POTENTIATE MESENCHYMAL STROMAL CELLS

Recently, Mesenchymal stromal cells (MSCs) were described to transfer mitochondria to target cells in lung diseases models, improving cellular bioenergetics and triggering beneficial effects (Ahmad et al., 2014). So, increasing mitochondria content, through mitochondrial artificial transfer (mitoception) could potentiate MSCs therapy improving mitochondrial transfer extension and benefits. This study was approved by the Ethics Committee (CEUA-UFRJ 004/20). Bone-marrow mesenchymal stromal cells (BMMSCs) were obtained from C57BL/6 mice (20-25 g, 8-10 weeks). MSCs-derived mitochondria were co-cultured with adherent MSCs for mitoception [1:1 (Mito1) or 5:1 (Mito5) donor: receiving MSCs ratio]. After 24 hours, mitoception was validated by MitoTracker Green, MitoTracker Red and MitoSOX Red by flow cytometry assay to estimate mitochondrial mass, function and mitochondrial-reactive oxygen species (mROS). mRNA levels of idoleamine (IDO)-1, superoxide dismutase (SOD)2, mitofusin (MFN)1, MFN2, and interleukin (IL)10 were evaluated. Mitoception increases MSCs mitochondrial mass (MSC = 21.17%, Mito1 = 33.55%, Mito5 = 41.05%, MSC vs Mito1  $p=0.0003$ , MSC vs Mito5  $p<0.0001$ ; Mito1 vs Mito5  $p= 0.0040$ ) and reduces mROS (MSC = 63.24%, Mito1 = 54.03%, Mito5 = 45.13%, MSC vs Mito5  $p=0.0544$ ), without changes in mitochondrial function (MSC = 72.60%, Mito1 = 81.65%, Mito5 = 74.20%). However, MSCs biomarkers MFN1, MFN2, and IL10 changed significantly their mRNA expressions (MFN1 [Fold change to MSC (Mito5 = 4.525,  $p= 0.0159$ )], MFN2 [Fold change to MSC (Mito5 = 0.37,  $p= 0.0281$ ], and IL10 [Fold change to MSC (Mito1 = 219.6,  $p= 0.0381$ ; Mito5 = 11.55,  $p= 0.0022$ )], while IDO1 and SOD2 do not present significative alterations (IDO1 [Fold change to MSC (Mito1 = 0.19, Mito5 = 0.63,  $p= 0.352$ ), SOD2 [ Fold change to MSC (Mito1 = 0.673, Mito5 = 0.76,  $p= 0.31$ )]. New results are still needed to understand whether and how doses of mitoception interfere with mitochondrial function in MSCs.

ID: 5135

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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### SEROLOGICAL AND EPIDEMIOLOGICAL ANALYSIS OF CHIKUNGUNYA VIRUS CASES IN THE CITY OF MONTES CLAROS, BRAZIL

Chikungunya is a febrile illness whose arthralgia is the most important and debilitating clinical feature. Differential diagnosis is a major challenge in Brazilian public health. The study aimed to serologically and epidemiologically investigate cases of chikungunya virus (CHIKV) infections that affected the population of Montes Claros, Minas Gerais in 2019. The study was approved by the Institutional Ethics Committee, opinion number: 2.073.117. It was quantitative and cross-sectional research. To detect the presence of IgM anti-chikungunya antibodies, an ELISA test was performed on 145 samples. The mean age was  $32.8 \pm 19.5$  years and 73% ( $n=106$ ) were female. The serological analysis found 23.4% ( $n=34$ ) positive samples, 24 samples from females and 10 from males, 88 negative samples, and 23 inconclusive. Positive cases were divided into 2 groups by sex, using the analysis of the 50% percentile

of age as a criterion. A higher proportion of positive cases was found in women under 30 years of age ( $p=0.04$ ). For the group of men, no differences were found between the proportions of positive cases for CHIKV in relation to age above or below 28 years ( $p=0.99$ ). CHIKV cases were detected in all regions of the city, predominantly in the urban environment. The highest incidences belonged to the south (10), north (8), east (8) and those with the lowest incidence were in the west (5), central (2), and rural (1) regions. Females were the most affected by the disease, probably because women seek more medical care and are therefore more diagnosed than men. Studies in the city showed that the largest cases of larval infestation by *Aedes aegypti* have occurred in the western portion, while the cases of infection by arboviruses are more prone in the eastern portion city. Territory stratification is an important support tool for planning arbovirus control actions.

ID: 5136

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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#### **FUCOSYLATED CHONDROITIN SULFATE FROM HOLOTHURIA GRISEA AS TREATMENT FOR EXPERIMENTAL AIRWAY INFLAMMATION**

Asthma is characterized by reversible airflow obstruction, which is caused by increased mucus production, inflammatory cell recruitment and bronchoconstriction. We hypothesized that Fucosylated chondroitin sulfate (FucCS) extracted from the body wall of sea cucumber *Holothuria grisea*, which hold glycosaminoglycan with anti-inflammatory properties, may be an alternative drug to treat experimental airway inflammation. FucCS was extracted and purified from *H. grisea* by proteolytic digestion and purification by salting out. This study was approved by the Animal Care and Use Committee of the Health Sciences Center, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil (CEUA: 054/19). 60 male (or female) C57BL/6 mice (6-8weeks) were sensitized intraperitoneally (IP) on days 0 and 14 with ovalbumin (ova, 2.5mg/kg) and aluminum hydroxide (50mg/kg), or saline. On day 15, animals were then challenged intranasally with ovalbumin (7.5mg/kg) or saline on seven occasions over 10 days<sup>1</sup>. The animals received therapy (IP) with: 1) FucCS (2mg/kg) or saline one hour after each challenge or 2) dexamethasone (2 mg/kg) on days 15, 17, 21 and 23. In the current model of airway inflammation, compared to control, total cells in the bronchoalveolar lavage fluid (BALF) were increased (380%,  $p=0.0004$ ) as well as peribronchial inflammation score (+351%,  $p=0.006$ ) and polymorphonuclear cell infiltration (+745%,  $p<0.001$ ). Treatment with FucCS (-34.5%,  $p=0.0124$ ) and dexamethasone (-30.9%,  $p=0.0193$ ) reduced peribronchial inflammation score. Polymorphonuclear cells infiltration was decreased with FucCS treatment (-58.3%,  $p<0.001$ ) and dexamethasone treatment (-56.1%,  $p<0.001$ ). In conclusion, *Holothuria grisea* FucCS reduced lung inflammation and may be a promising therapy for asthma. Further studies are needed to elucidate the mechanism of action of FucCS in asthma.

ID: 5137

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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### **TREATMENT WITH ANGIOTENSIN-(1-7) DURING THE SENSITIZATION PHASE ATTENUATES ALLERGIC PULMONARY INFLAMMATION**

Previous studies have shown that treatment with angiotensin-(1-7) [Ang-(1-7)] during the challenge period in addition to produce anti-inflammatory and antifibrotic effects, reduced the levels of plasma IgE in ovalbumin (OVA)-induced allergic lung inflammation. In the present study, we evaluated the effect of Ang-(1-7) treatment in the antigen sensitization period in an experimental model of asthma. Male balb/c mice (8 weeks of age, weighing 20-25g) were randomized in control group, sensitized and challenged with OVA and sensitized and challenged with OVA treated with Ang-(1-7) included in HP $\beta$ -CD (60  $\mu$ g/Kg/day, by gavage) along with the sensitized period of 7 days (CEBIO, UFMG – CEUA: 189/2017). Sensitization was performed by 2 injections of OVA (100 $\mu$ g/ mouse, i.p.) in 2% aluminum hydroxide gel adjuvant at 7 days interval. Five days after 2nd sensitization, sensitized mice were challenged with OVA (10 $\mu$ g of OVA/day, intranasal) for 8 days. Forty-eight hours after the last challenge, exhaled fraction of nitric oxide (FeNO) and pulmonary mechanics were evaluated and blood sample, bronchoalveolar lavage fluid (BALF) and lung were collected. Ang-(1-7) given only at sensitization period reduced the accumulation of eosinophils, pulmonary inflammation and the level of IL-4 and CCL11 in the lungs. Ang-(1-7) also decreased IgE in the plasma. Further, Ang-(1-7) prevented OVA-induced changes in exhale FeNO, pulmonary mechanics and extracellular matrix deposition in the lung. These results show that treatment with Ang-(1-7) interferes with sensitization to the antigen and pave the way for the development of a new therapy to change the course of asthma pathophysiology.

*ID: 5138*

*Área: Fisiologia de Órgãos e Sistemas: Endócrina*

*Forma de Apresentação: Ê-POSTER*

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### **MACROSCOPIC AND RELATIVE WEIGHT CHANGES IN THE PANCREAS OF FEMALE WISTAR RATS AFTER CHRONIC ADMINISTRATION OF VITAMIN D IN A NON-ALCOHOLIC FATTY LIVER DISEASE MODEL**

Vitamin D (VD) is a pleiotropic cell modulator in the organism. In view of this, VD has been shown to be an important regulator in the prevention and progression of metabolic diseases, such as non-alcoholic fatty liver disease (NAFLD), however the role of VD in NAFLD about a chronic administration, it is still unknown. Thus, the aim of this study was to evaluate macroscopic and relative organ weight changes in the face of chronic RV administration in an experimental model of NAFLD in wistar rats. The experimental protocol was approved at CEUA UNIPAMPA (016/2020). For this, rats (n=30 males

and n=30 females) were submitted to NAFLD with the ingestion of hyperlipidic food and water enriched with 45% sucrose for 45 days. After NAFLD induction, the animals remained on feed and water ad libitum and were divided into 5 groups (n=6): G1: EH+ saline, G2: EH+ 500IU/kg/day, G3: EH+ 1000 IU/kg/day, G4: EH+ 2000 IU/kg/day and G5: EH+3000 IU/kg/day. VD was administered by gavage once a week for 1 month. Afterwards, the animals were euthanized using an overdose of anesthetics via IP. The liver, kidney, pancreas and abdominal fat were removed, weighed, and the relative weight (RW) of the viscera was obtained. Normality (Shapiro-Wilks) and homogeneity (Levene) tests were performed, followed by one-way ANOVA. The results show, in the macroscopic analysis, the liver with a dense yellowish appearance, kidney with lithiasis, abdominal fat with the usual appearance, and the dense pancreas, with an opalescent reddish appearance. Regarding the RW of the organs, there was a normal and homogeneous distribution between the groups, with significance between the groups in the RW of the female pancreas ( $\bar{X}$ = 0.003, SD= 0.002, p=0.02). The change found suggests the presence of inflammatory processes and oxidative stress in the organ. Biochemical, histological and oxidative stress analyzes will be carried out afterwards to better clarify the relationship between NAFLD and chronic VD administration.

ID: 5140

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP)

### **THE IMPACT OF ABSENCE OF MATERNAL MELATONIN DURING PREGNANCY AND LACTATION ON OFFSPRING'S DEVELOPMENT AND FEEDING BEHAVIOR**

Melatonin is synthesized by pineal gland during the dark phase and acts as a hormone that transmits photoperiodic information. This hormone has been involved in the regulation of energy metabolism including food intake, modulating hypothalamic leptin signaling pathways. During pregnancy, physiological and behavioral adaptations are observed to ensure the supply of adequate energy substrate for the conceptus. In this case, melatonin plays a key role in this scenario. The aim of the study is to investigate the absence of maternal melatonin during pregnancy and lactation on the development and functioning of the hypothalamic nucleus related to the feeding behavior of offspring. Wistar rats were divided into pregnant rats: control (CTL), pinealectomized (PINX) and with melatonin replacement (PINX-Mel). Body weight and food intake of male offspring were measured from 21<sup>o</sup> day to 6 months of age. Genes involved in the hypothalamic control of feeding behavior were analyzed in the same periods mentioned above, at ZT18 (6 hours after the beginning of the light phase,) when melatonin peaks (CEUA 86/2016). Pups from PINX mothers had lower food intake and body weight compared to pups from CTL mothers. At 21 days of age, LepR, STAT3 and POMC show increased transcription in the middle hypothalamus in pups from PINX mothers compared to pups from CTL mothers. Furthermore, melatonin replacement was able to restore the transcriptional profile of STAT3 compared to the CTL. Finally, at 6 months of age, the offspring from CTL mothers showed no difference in MCH and CRH expression compared to animals at 21 days. On the other hand, offspring of PINX mothers show an increase in the expression of these genes at 6 months of life, compared to animals at 21 days. The absence of maternal melatonin during pregnancy and lactation reflects on food intake and offspring weight gain, altering the hypothalamic gene expression profile. Interestingly, the changes observed at 21 days are modulated throughout life, so that they are not observed at 6 months of age, suggesting a possible recovery of the hypothalamic system in response to the absence of maternal melatonin.

ID: 5141

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP) - ICB

### **PHOX2B MUTATION MEDIATED BY ATOH1 EXPRESSION IMPAIRED RESPIRATORY RHYTHM AND VENTILATORY RESPONSES TO HYPOXIA AND HYPERCAPNIA**

Retrotrapezoid nucleus (RTN) are involved in central chemoreception and respiratory control. Lineage studies demonstrate RTN neurons to be derived from Phox2b and Atoh1. Phox2b exon 3 mutations cause Congenital Central Hypoventilation Syndrome (CCHS), producing an impaired respiratory response. Our goal was to investigate if a conditional mutation of Phox2b within Atoh1-derived cells might affect respiratory rhythm; ventilatory responses to hypercapnia and hypoxia and number of RTN-chemosensitive neurons. We used a mouse line carrying a conditional Phox2b $\Delta$ 8 mutation (Animal Care/ Committee guidelines (protocol: 3618221019) and crossed them with Atoh1-cre mice. Ventilation was measured during neonate and adult life. In room air, experimental and control groups showed similar basal ventilation (neonates mutant:  $2.3 \pm 0.3$  vs. control:  $1.6 \pm 0.2$  ml/min/g,  $p = 0.138$ ; adults mutant:  $3.5 \pm 0.3$  vs. control:  $2.7 \pm 0.2$  ml/min/g,  $p = 0.104$ ). However, Atoh1-cre/Phox2b $\Delta$ 8 adult mice increased breath irregularity ( $0.085 \pm 0.01$  vs. control:  $0.026 \pm 0.003$ ;  $p = 0.0003$ ). The hypercapnia and hypoxia ventilatory response were impaired in neonates (CO<sub>2</sub> FR from:  $100\% \pm 9\%$  to:  $113\% \pm 5\%$ ;  $p = 0.36$ ; Vt from:  $100\% \pm 9\%$  to:  $124\% \pm 13\%$ ;  $p = 0.22$ ; VE from:  $100\% \pm 15\%$  to:  $128\% \pm 11\%$ ;  $p = 0.22$ ; O<sub>2</sub> FR from  $100 \pm 10$  to  $123 \pm 8\%$ ;  $p = 0.26$ ; Vt from  $100 \pm 6$  to  $105 \pm 9\%$ ;  $p = 0.91$ ; VE from  $100 \pm 15$  to  $144 \pm 18\%$ ;  $p = 0.37$ ). In contrast, adult mice recovered ventilatory response to hypercapnia, but not to hypoxia (FR from:  $100 \pm 4$  to:  $146 \pm 5$ ;  $p=0.0009$ ; mutant mice from:  $100 \pm 5$  to:  $154 \pm 10$ ;  $p=0.032$ ). We also observed a reduction of Phox2b+/TH- expressing neurons within the RTN region ( $143 \pm 41$  vs. control:  $266 \pm 16$ ;  $p = 0.0317$ ). Our data indicates that conditionally expression of Phox2b mutation by Atoh1 affect development of the RTN neurons and are essential for the activation of breathing under hypoxic and hypercapnia condition, providing new evidence for mechanisms related to CCHS neuropathology.

ID: 5142

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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### **PHARMACOLOGICAL CONCENTRATIONS OF MELATONIN MODULATE THE ACTIVATION OF PANCREATIC STELLATE CELLS SUBJECTED TO HYPOXIA**

Pancreatic stellate cells (PSCs) are major players in the fibrosis that develops in pancreatic cancer. Due to the rapid growth of the tumoral tissue, a hypoxia condition is established under which cells included in the mass can proliferate. Additionally, melatonin has gained attention as an agent with therapeutic potential against pancreatic cancer. In this study we have investigated the effect of melatonin on PSC activation under hypoxic conditions. Cell viability and cell proliferation was measured by crystal violet test and BrdU incorporation test. Caspase-3 activation was determined by flow cytometry. Cyclins,  $\alpha$ -sma, metalloproteases (MMPs), COX-2 and the activation of NF- $\kappa$ B were analyzed by western blot. IL-6 and TNF- $\alpha$  was determined by RT-qPCR. Melatonin reduced the viability and proliferation of PSCs under hypoxia modulating cell cycle and activating the apoptotic pathway. The expression of  $\alpha$ -sma and MMPs, markers of PSC activation, was decreased by the indolamine. Furthermore, the activation of the inflammatory signaling pathway of NF- $\kappa$ B and the expression of proinflammatory cytokines was reduced by melatonin treatment under hypoxia. Under hypoxia, PSC develop a more proliferative status compared with normoxic conditions. On the contrary, melatonin reduces this proliferative rate modulating cell cycle and apoptosis. PSCs reduces the expression of PSCs markers of activation and the proinflammatory profile of PSC under hypoxia. Therefore, melatonin could be taken into consideration as potential therapeutic agent for pancreatic fibrosis.

ID: 5143

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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## **RESPIRATORY ANATOMOFUNCTIONAL CHANGES FOLLOWING APOCYNIN TREATMENT IN A PARKINSON'S DISEASE MODEL**

Parkinson's disease (PD) is a progressive neurodegenerative disease characterized by the loss of dopaminergic neurons in the Substantia Nigra (SN). There are several motor and non-motor symptoms, such as respiratory problems. It's also known that oxidative stress (OS) is directly related to the neurodegeneration and also developed in respiratory regions, noted in 6-hydroxydopamine (6-OHDA) animal models, causing a high loss in respiratory function, which may be due to increased enzymatic activity of NOX. Evaluate the effects of the NOX non-specific inhibitor, apocynin (APO), preventing the neurodegeneration of respiratory nuclei and the respiratory deficits in 6-OHDA animals. Wistar male rats (n=19) were set up in 4 experimental groups: I) Vehicle, II) 6-OHDA, III) Vehicle treated with APO and IV) 6-OHDA treated with APO (CEUA nº 2740200319). Vehicle or 6-OHDA (24 $\mu$ g/ $\mu$ l) were injected bilaterally into the striatum to produce the PD model. At 20 days after surgery, groups III and IV were treated with APO (50mg/ml/kg, water intake, for 20 days). At 40 days after surgery, respiratory parameters were recorded by whole body plethysmography and the immunohistochemistry was performed in the brains. 6-OHDA reduced TH<sup>+</sup> neurons in SN and APO treatment did not reverse it (p<0.0001). At normoxia, 6-OHDA animals showed reduced respiratory frequency (fR)(p=0.0003) and ventilation (VE) (p=0.0401) with an increase in inspiratory time (Ti) (p=0.0001). During hypercapnia, 6-OHDA rats showed reduced fR (p=0.0010) and VE (p=0.0014) with changes in Ti and expiratory time (Te) (Ti: p=0.0019; and Te: p=0.0019). Quantification of neurons labeled with NK1 receptor of the rVRG (p=0.0389) and the preBötC (p=0.0353), and the Phox2b marker of the NTSc (p=0.0302), NTSi (p=0.0327) and RTN (p=0.0388). Treatment with APO improved respiratory function and prevented the neurodegeneration in respiratory nuclei in PD animal models.

ID: 5144

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### CHARACTERIZATION OF ACUTE KIDNEY INJURY INDUCED BY CECUM LIGATION AND PUNCTURE MODEL

Sepsis is one of the leading causes of acute kidney injury (AKI). This study aimed to run a morpho functional characterization of an animal model of AKI induced by CLP-induced-sepsis using increasing number of perforations (protocol number 021/20). Sixty adult Wistar rats were randomly separated into false operated (Sham) group, submitted to ligation with either two punctures in the cecum (CLP2P), five punctures (CLP5P) or ten punctures (CLP10P). Animals were harvested at 72h for blood, urine and renal tissue collection. The mortality in CLP2P and CLP5P were 7.7% in 24h, 15.4% in 48h, and CLP 10P presented 50.0% of mortality in 24h, 20.8% in 48h. Clinical signs of a systemic inflammatory response were more frequent and pronounced in animals from CLP10P. The CLP5P ( $0.007 \pm 0.0007$ ) and CLP10P ( $0.006 \pm 0.0012$ ) showed a significant reduction in urinary flow compared to Sham ( $0.010 \pm 0.0008$ ) and CLP2P ( $0.008 \pm 0.0005$ ). CLP10P showed a significant reduction in glomerular filtration rate,  $\text{Na}^+$  and  $\text{K}^+$  excretion and clearance. Histopathological analysis of renal tissue showed structural changes characteristic of the CLP model but with different intensities. The CLP 10P showed an increase in both tubular injury score and injury score. CLP10P ( $15.00 \pm 5.24$ ) showed a significant increase in pro-IL-18 mRNA relative levels when compared to Sham ( $1.17 \pm 0.19$ ), CLP2P ( $1.99 \pm 0.70$ ) and CLP5P ( $3.14 \pm 0.58$ ). Increased levels of pro-IL-1 $\beta$  mRNA were observed in CLP5P ( $19.44 \pm 6.33$ ) and CLP10P ( $22.96 \pm 4.99$ ) compared to Sham and CLP2P. Only CLP10P showed a significant increase in the relative mRNA levels of the KIM-1 molecule ( $15.00 \pm 5.24$ ) and NGAL ( $9.36 \pm 2.90$ ) when compared to other groups. On the other hand, CLP5P and CLP10P presented a raise in leukocytes and lymphocyte neutrophil ratio. All CLP groups showed hypoglycemia, more pronounced in the CLP10P. C-reactive protein, was increased only in the CLP10P. Thus, AKI can be induced in a more severe animal model of sepsis.

ID: 5145

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### OBESITY INDUCES DEPRESSIVE-LIKE BEHAVIOR ON RATS

Obesity is a risk factor for the development of other health problems, like metabolic syndrome and mood alterations, like depressive behavior. The objective of this study was to evaluate if a cafeteria-diet-induced obesity can cause a depressive-like behavior in female rats. At the 31st day of life, 7 female Wistar rats started a cafeteria diet (CAF), consisted of industrialized, high-palatable, hypercaloric food and soft drinks, added to their regular chow, that persisted until the end of the experiment. Other 7 rats

formed the control group (CON) and were fed only rat chow for the same period. At 91 days of life, all rats were tested in the forced swim test (FST) and in the open field test (OFT). On the next day, they were weighed and decapitated. Retroperitoneal, mesenteric and periovarian fat were removed and weighed. The sum of the 3 stocks were compared between groups as percentage of their body mass. Data was analyzed by t-Student test and expressed as media  $\pm$  standard deviation. CAF did not alter rat's body weight but caused an 149% increase in percentage of stored fat per body weight (CAF:  $7.7 \pm 1.0$ ; CON:  $3.1 \pm 0.4$ ;  $p < 0.05$ ). In the FST, CAF group presented a higher immobility time than CON group (CAF:  $117.3 \pm 12.5$  s; CON:  $57.9 \pm 10.2$  s;  $p < 0.05$ ), as well as a reduction on climbing time (CAF:  $54.5 \pm 10.3$  s; CON:  $107.2 \pm 14.5$  s;  $p < 0.05$ ), with no differences in swimming time. Also, no differences were found in the OFT, both in ambulation (CAF:  $110.7 \pm 50.1$ ; CON:  $98.9 \pm 25.5$ ) and rearing (CAF:  $28.2 \pm 14.7$ ; CON:  $23.1 \pm 8.2$ ) scores. It can be concluded that CAF caused obesity in female rats, confirming its utility as a model of obesity, and this obesity was accompanied by a depressive-like behavior. This association can be related to the higher inflammatory state triggered by cytokines released by adipocytes that alter neurotransmitter release and reuptake in the brain. Also, it could be related to the effects of leptin on the central nervous system.

ID: 5151

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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## DOES A VEGAN-VEGETARIAN DIET INCREASE BODY FAT CONTENT?

Plant-based diets are believed to be beneficial to health even in the presence of disease. The main aim of our study was to look deeper and compare the body composition of vegetarians-vegans and omnivorous individuals. A cross-sectional analysis focusing 111 healthy participants, 39 vegetarian-vegan and 72 omnivores was performed. The mean age of the study population was 28.12 years old, and 73% were women. Descriptive dietary variables were collected by trained technicians. Those included weight, height, abdominal circumference, smoking status, physical activity practice and dietary intake. Body composition was assessed using a dual-energy x-ray absorptiometry (DXA Lunar Prodigy Advance) and bioelectrical impedance (BIA Tanita TBF 300®). All procedures were previously submitted to the institutional Ethical Commission (Proc. BC.ECTS.ZY21). Vegetarian-vegan group had higher volume of fat mass (FM), mainly in arms, body and total fat mass compared to those individuals following an omnivorous diet ( $p < 0.05$ ). Additionally, we also observed that those same vegetarian-vegan participants also presented a significantly higher volume of Visceral Adipose Tissue (VAT) compared to the omnivorous group (486.69 vs. 268.60 cm<sup>3</sup>, respectively;  $p < 0.05$ ). However, no other statistical differences were observed regarding the distribution of other body composition tissues (lean, tissue, fat free, bone and, total mass). A positive and significant association (odds ratio) between excess fat mass and vegetarian-vegan regime was also found even in the full adjusted model. When we compared the FM detected with DXA and BIA, a weak correlation was observed ( $r = 0.8639$ ;  $p < 0.01$ ). In absolute terms BIA underestimated FM by 15.5% in comparison with DXA. In conclusion, higher levels of FM and VAT were found in vegetarian vegan individuals. Other longitudinal and larger studies are needed to better understand the full significance of this finding.

ID: 5152

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### ENHANCEMENT OF SUCROSE INTAKE IN RENOVASCULAR HYPERTENSIVE RATS

The 2-kidney, 1-clip (2K1C) renovascular hypertensive rats have greater activity of the renin angiotensin system (RAS) and angiotensin II (ANG II) production. ANG II induces sodium intake and the repeated activation of ANG II-dependent natriorexigenic mechanisms increases sucrose intake. Thus, it is possible that chronic high levels of ANG II increase sucrose intake by 2K1C rats. Thus, the aim of the present study was to investigate whether sucrose intake would be increased in 2K1C rats. The experimental procedure was approved by CEUA-UFC (#5096300718). Male Wistar rats ( $\approx$  150 g, 5 weeks old,  $n = 7-12$ /group) received a silver clip in the left renal artery to induce hypertension. Sham animals underwent similar surgery, but no clip was placed around the renal artery. Seven weeks after the surgery, 2K1C and sham rats had intermittent access to 0.06 M sucrose and water for 2 hours for 5 consecutive days. The mean arterial (MAP) was recorded in conscious rats to confirm hypertension. The ingestion of 0.06 M sucrose was increased in 2K1C compared to sham rats on the 2nd ( $11.3 \pm 3.1$  ml/2h, vs. sham:  $3.3 \pm 0.7$  ml/2h;  $p < 0.05$ ), 4th ( $13.0 \pm 4.5$  ml/2h, vs. sham:  $5.8 \pm 0.9$  ml/2h;  $p < 0.05$ ) and 5th days ( $12.6 \pm 3.9$  ml/2h, vs. sham:  $6.6 \pm 2.1$  ml/2h;  $p < 0.05$ ), with no significant difference on the 1st ( $6.8 \pm 1.9$  ml/2h, vs. sham:  $2.2 \pm 0.6$  ml/2h;  $p > 0.05$ ) and 3rd days ( $8.5 \pm 2.9$  ml/2h, vs. sham:  $4.6 \pm 0.9$  ml/2 h;  $p > 0.05$ ). There was no change on water intake by 2K1C and sham rats throughout the tests ( $p > 0.05$ ). Baseline MAP was significantly higher in 2K1C rats ( $162.5 \pm 10.8$  mmHg, vs. sham:  $102.6 \pm 2.5$  mmHg;  $p < 0.05$ ). The left kidney/right kidney weight ratio in 2K1C rats was decreased compared to values observed in sham rats ( $0.67 \pm 0.05$ , vs. sham:  $0.95 \pm 0.02$ ;  $p < 0.05$ ). Therefore, the results suggest that 2K1C hypertensive rats have a higher sucrose intake compared to normotensive rats.

ID: 5155

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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### CORRELATION BETWEEN AGE AND PERCENTAGE OF LYMPHOCYTES, NEUTROPHILS AND NEUTROPHIL/LYMPHOCYTE RATIO IN PATIENTS WITH COVID-19 UNDER HOME TREATMENT

Introduction: Individuals hospitalized with severe CoViD-19 have a lower percentage of lymphocytes, a higher percentage of neutrophils and an increased neutrophil/lymphocyte ratio. Several studies have shown that the worst prognosis of the disease is related to the patients' age, gender and presence of comorbidities such as obesity, however, no study has demonstrated the relationship of these variables in patients with mild CoViD-19 under home treatment. Aims: To evaluate whether age, sex and body mass index (BMI) affects white blood cell count of patients with mild CoViD-19 under home treatment.

**Methodology:** Fifty-eight adults CoViD-19 patients, of both sexes, participated in the study. Age, sex, weight and height to calculate the BMI were informed by the patients. Blood collection was performed to perform the white blood cell count using a hematology counter. Correlation between age, BMI and leukocyte count was performed using Pearson's correlation and for variable gender the Chi-Square test was used. **Results:** Patients were aged between 22 and 78 years, 65.5% were women and 34.4% were men. BMI ranged between 18 and 40 kg/m<sup>2</sup>. A positive correlation was observed between neutrophils percentage and patients age ( $r = 0.26$ ,  $p = 0.04$ ). A negative correlation between lymphocytes and age was also observed ( $r = -0.31$ ,  $p = 0.01$ ). The correlation between age and the neutrophil/lymphocyte ratio was positive ( $r = 0.33$ ,  $p = 0.01$ ). No correlation was found between age and other WBC parameters, including platelet count. There was also no correlation between gender and BMI with white blood cell count data. **Conclusion:** Even in patients with mild CoViD-19 under home treatment, age was found to be a contributing factor in hematological alterations. Further studies will contribute to understand the how old age and hematological alterations contributes to CoViD-19 pathophysiology in mild disease.

ID: 5156

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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## ASSOCIATION OF SARS-COV-2 ANTIBODY RESPONSE

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a newly emerged coronavirus responsible for the current pandemic of coronavirus disease 2019 (COVID-19), which has resulted in more than 190 million infections and 4 million deaths until 21 July 2021. Vaccine and therapeutic discovery efforts are paramount to curb the pandemic spread of this zoonotic virus. In this study, to compare the differences of the SARS-CoV-2 IgM, IgG, IgE and IgA antibody and a possible relationship between aged, sex and time after infection (mainly 1-7 months), 243 individuals confirmed SARS-CoV-2 infection were enrolled. The serum of these individuals was collected and detected for the SARS-CoV-2 IgM, IgG, IgE and IgA antibody. Approval (37357020/4.0000/5699) by the Human Experimentation Ethics Committee. We observed that serum IgM and IgA significantly reduction between month 1 to 7 after infection. Notably, IgM and IgA levels in high percentage of individuals (97% and 89%, respectively) declined by half (47%, both) within 1 to 2 month and then sustained over the 7 months. The IgG percentage of individuals remained stable between month 1 to 7 after illness onset (94% - 100%) showing high positivity rates. The IgE levels was an exception with low positivity rates (9% - 7%) between month 1 to 7 after illness onset. Regarding about sex differences and antibody production, our data obtained didn't show correlation with to SARS-CoV-2, differently when we correlate age and antibody production, where the level showed a positive correlation with individuals over 60 years old. The results suggest that SARSCoV-2 viral specific antibody response profiles are distinct in different age groups and time after infection. This data can help create age-targeted strategies rises serious concerns on the robustness and sustainability of the humoral immune response in the period after infection, which is crucial for immunity strategy and developing a vaccine.

ID: 5157

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### COMPARATIVE ANALYSIS OF TGF $\beta$ AND HIGH GLUCOSE INDUCED RESPONSES IN HUMAN PODOCYTE IN VITRO

Podocytes are important kidney cells to the constitution and maintenance of the glomerular filtration barrier. Therefore, damage to these cells can cause proteinuria, one of the main markers of kidney damage. It is already known that high glucose (HG) induces inflammatory responses and oxidative stress in podocytes. Activation of TGF $\beta$  signaling can also cause effects similar to those caused by high glucose, in addition to fibrosis and epithelial-mesenchymal transition. Furthermore, autophagy process dysfunction is also linked to podocyte injury. This work aims to analyze the differential expression of genes in human podocytes treated with TGF $\beta$  or HG, observing how these treatments provide cellular responses. Human podocytes were cultured in vitro and treated for 72h in RPMI medium only (n=5) or plus TGF $\beta$  10ng/ml (n=6) or glucose 30mM (n=5). Then, the cells were collected and the expression of genes was evaluated through real-time PCR. In cells treated with TGF $\beta$ , there was a significant reduction (p<0.05) in the expression of Wt1, an important transcription factor for podocyte function. HG induced a 35% reduction in its expression; however, it was not significant. Both treatments induced a reduction in Atg7, a gene related to autophagy. Furthermore, HG treated cells showed an increase in Tfeb, the main transcription factor related to this process. With these preliminary results, we could observe that TGF $\beta$  and HG provide distinct responses in podocytes, through the differential expression of genes and, therefore, may regulate cellular responses to injury through different pathways.

ID: 5159

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### SIF DATASET: A DATASET BASED ON STRESS INDUCTION

Wearables have received more space on smart healthcare in recent years. The wearables have many applications, ranging from short data acquisition for the physical assessment of athletes to continuous monitoring of patients in hospital environments or remotely. In the context of monitoring, there is the possibility of monitoring people and detecting episodes of stress. Through defined triggers, the system notifies the psychologist so that he can propose an intervention. We aim to collect a dataset based on inducing stress based on repetitive negative thoughts. The acquired dataset has ECG, EDA, EMG, gender, age, height, weight, BMI, and clinical status. Obtaining a dataset is essential to assess the effects of stress on physiological signals and thus find patterns in these data. With the definition of patterns

through artificial intelligence, it is possible to apply them to a monitoring system. The methodology used for this work consists of using a physiological data acquisition architecture composed of Wearable and Single-Board Computer. We conducted a stress-inducing experiment approved by the university's ethics committee (CAAE: 40555420.0.0000.5344). The procedure starts with the participant resting state for 5 minutes. Then, stress induction for 1 minute, prompting them to think about a moment that left the participant upset or distressed. Finally, the participant returns to the resting state for five minutes. The age of the 27 participants in the experiment varies between 19 and 38 years, eight men and 19 women, with clinical and non-clinical conditions. We verified an average increase of 10% during the stress induction period concerning the normal state. After two minutes of relaxation, the participant returned to baseline. However, we observed a tendency for participants with a clinical picture to have a lesser reaction to stress induction or difficulty to return to baseline. This result is convergent with the allostasis charge theory.

ID: 5161

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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#### **EVALUATION OF NEUTROPHIL FUNCTION IN RESPONSE TO INTENSIFIED PHYSICAL TRAINING WITH DAILY RECOVERY BY COLD WATER IMMERSION**

According to the duration and intensity, physical exercise can promote an inflammatory response in the exercised muscles. It is proposed that neutrophils and monocytes recruited in response to exercise may be involved in skeletal muscle clearance or secondary tissue damage. Many strategies are used by athletes to maximize exercise recovery, including cold water immersion. Although popular among athletes, it is not yet known whether it has any effect on neutrophilia and other exercise-induced changes. Thus, this study evaluated the effect of cold-water immersion after intensified physical training on athletes' neutrophil function. Twenty-one athletes participated in the 11-day intensified exercise training. The training consisted of two 5-days blocks with a 1-day rest in between. Each day consisted of 30 min of running at 75% of Vmax, followed by 11 bouts of 300 m of running at Vmax with 1.5 min intervals between each bout. Immediately after, the volunteers recovered by immersion in water at 10 ° C, for 15 min, in the supine position. In the control group, the volunteers remain seated for 15 min at room temperature. Blood samples were collected before, 2h and 24h after the 1<sup>st</sup> and 11th training days, and before the 7th training session. Neutrophils functions (phagocytic activity, reactive species generation, surface receptors expression and redox state biomarkers). The training period did not cause changes in the oxidative damage biomarkers, as well as it did not induce changes in the antioxidant capacity and in the phagocytic capacity of neutrophils, just before the last training session and it remains 2 hours later. Furthermore, no effect on basal production of reactive species by neutrophils was observed, however, these results show a possible effect of the cold-water immersion protocol in maintaining the basal production of reactive species by neutrophils in response to the intensified training period.

ID: 5162

Área: Fisiologia de Órgãos e Sistemas: Renal

*Forma de Apresentação: Ê-POSTER*

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### **THE TREATMENT WITH GOLD NANOPARTICLES IMPROVES RENAL FUNCTION IN SUBCLINICAL ACUTE KIDNEY INJURY MODEL**

Subclinical acute kidney injury insult, subAKI, is silent process characterized by renal dysfunction, as measured by proteinuria without changes in glomerular filtration rate. subAKI is caused by proximal tubule (PT) albumin overload leading to pro-inflammatory profile and tubule-interstitial injury. Despite to be an important process few attentions has been given to development of therapeutic strategies. Treatment with gold nanoparticles (AuNP) has been suggested to induce anti-inflammatory effects. Here, our aim was to analyze the impact of AuNP treatment in a murine subAKI model. 8-10 weeks-old male C57BL/6 mice were divided into 4 experimental groups: control (1); AuNP (2), administered by daily intraperitoneal injection in a dose of 10µg/Kg; subAKI (3), induced by daily intraperitoneal injection of 10g/Kg of albumin; subAKI + AuNP (4) (CEUA045/17). Renal function and histological analysis were performed. Initially, animals in the subAKI group showed a significant increase in proteinuria ( $3.68 \pm 1.99$  mg/24h) and urinary  $\gamma$ -glutamyl transferase activity ( $80.1 \pm 39.5$  U/L), a marker of proximal tubule injury, compared to the control group ( $0.62 \pm 0.32$  mg/24h and  $8.40 \pm 4.86$  U/L, respectively). Treatment with AuNP significantly reduced these two parameters ( $1.43 \pm 0.79$  mg/24h and  $47.80 \pm 26.17$  U/L, respectively). It is noteworthy that AuNP has no nephrotoxic effect in this model. Histological analysis by periodic acid-Schiff (PAS) staining demonstrated a significant increase in the interstitial space of the subAKI group which was partially reversed in the subAKI+AuNP group. Additionally, Picro Sirius Red staining showed a greater deposition of collagen fibers in the subAKI group, which was totally reversed in the subAKI+AuNP group. These results demonstrate that treatment with AuNP is effective to improve renal function in a murine subAKI model.

*ID: 5163*

*Área: Fisiologia do Exercício*

*Forma de Apresentação: Ê-POSTER*

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### **FEASIBILITY OF HIGH-INTENSITY TRAINING AND ITS EFFECTS ON THE PROGRESSION OF MOTOR SYMPTOMS IN ADULT INDIVIDUALS WITH PARKINSON'S DISEASE: A SYSTEMATIC REVIEW AND META-ANALYSIS**

Parkinson's neurodegeneration is associated with motor and non-motor deficits that compromise functional performance and quality of life. The benefits of exercise to the population with Parkinson's disease are already described, but a specific recommendation for the prescription of the variables of the exercise is still open for discussion. This systematic review with meta-analysis (PROSPERO CRD42020188473) aims to verify which evidences about the feasibility of the high intensity exercise

for people with Parkinson's disease are found in literature, as well as its effects on the modification and progression of the motor symptoms. Of 3.159 titles, 21 randomized clinical trials with 1.540 volunteers, including high intensity training interventions versus moderate intensity, or usual care control group, demonstrated the exercises of high intensity generated more benefits than the moderate intensity for the delays in the progression of the motor symptoms, besides being safe and viable, with good adherence rate and training protocols performed within the chosen target HR range. The meta-analysis of random effects showed improvement in the disease progression ( $P < 0.00001$ ; IC 95%, -3.49 [-4.83; -2.16]), in the functional mobility of the lower limbs ( $P = 0.005$ ; IC 95%, -1.21[-2.05; -037]), maximum oxygen consumption ( $P < 0.00001$ ; 95% CI, 17.2 [1:51; 2.82]) and quality of life ( $P = 0.001$ ; IC 95%, -1.29 [-2.08; -0.50]), both related to the progression of motor symptoms. Thus, high-intensity physical training, performed in both continuous and interval mode, with a weekly frequency between two and three times a week, proved to be safe and viable for individuals with PD and seemed to generate more benefits than moderate-intensity training, performed at the same frequency, to improve motor symptoms and delay disease progression.

ID: 5164

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP)

## INVESTIGATING EPIGENETIC ALTERATIONS IN PODOCYTE INJURY

The damage of podocytes is associated with proteinuria, the main clinical presentation of chronic kidney diseases. Yet, no treatment is available to prevent podocyte loss. Thus, it is urgent to understand more about podocyte biology, how they respond to insults and which pathways can be used as target to suppress podocyte detachment from the glomerular basement membrane and the consequent disruption of the glomerular filtration barrier. Therefore, our goal is to investigate whether epigenetic alterations, especially methylation and hydroxymethylation of cytosines in the promoter regions of certain genes are playing an important role in podocyte injury. To answer this question, we induced podocyte damage in vivo by single tail injection of Adriamycin (Adr group; 10.5 mg/kg) in male Balb/C mice (6-weeks old, 18-22g, n=16) and compared them with a PBS receiving group (Ctrl group, n=12). Total kidney tissue was collected 7 days after the injection (CEUA 5348280918) and subjected to Western Blot and qPCR. We found that podocyte-specific proteins such as podocin, nephrin and WT-1 had decreased protein levels in Adr mice (vs Ctrl,  $p < 0.05$ ). Furthermore, Adr mice showed activation of  $\beta$ -catenin pathway, associated with decreased klotho expression, induction of mesenchymal-specific protein such  $\alpha$ -SMA and fibrogenic genes such as TGF $\beta$  and collagen IV (vs Ctrl,  $p < 0.05$ ). All these alterations were accompanied by albuminuria and glomerulosclerosis (vs Ctrl,  $p < 0.05$ ) as observed by quantitative immune assay and tissue staining with periodic acid schiff, respectively. Finally, we have started to investigate the expression of two members of the ten-eleven translocation (TET) enzyme family, TET1 and TET3, which are responsible for DNA hydroxymethylation and gene activation as well as DNA methyltransferase (DNMT1) which adds a methyl group on cytosine and promote gene inactivation. Adr mice showed decreased transcript levels of Tet1, unchanged expression of Tet3 and increased expression of Dnmt1 compared to Ctrl mice. In conclusion, our preliminary results indicate a possible increase in methylation status.

ID: 5165

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### GASTRIC RETENTION OF NaCl SOLUTIONS IS ALTERED IN 2-KIDNEY-1-CLIP HYPERTENSIVE RATS

The 2-kidney-1-clip renovascular hypertension (2K1C) model elicits exacerbated production of angiotensin II and also gastric dysmotility. Central angiotensinergic mechanisms are involved on the enhanced NaCl intake by 2K1C rats. Gastric retention (GR) varies according to the tonicity of test meal and hydromineral body status. Thus, we studied if 2K1C alters the GR of a liquid test meal in rats. The experimental protocols were approved by CEUA-UFC (#1854140420). Male Wistar rats ( $\approx$  150 g, 5 weeks old) underwent unilateral renal artery stenosis or sham surgery. Systolic blood pressure (SBP) was monitored by tail-cuff plethysmography. In the 4th post-surgical week (PSW), rats were housed in individual cages with water, 0.3 M NaCl and chow ad libitum and daily intake was recorded. In the 5th PSW, rats had free access only to rehydration solution (Hydraplex®) for 12-h. Then, rats received by gavage (1.5 ml) the liquid test meal (0.15 or 0.3 M NaCl with phenol red). After 15 minutes, rats were euthanized under anesthesia for gut removal and GR analysis by fractional dye recovery. Data are expressed as mean  $\pm$  SEM. SBP was higher ( $p < 0.05$ ) in 2K1C rats (2K1C-ISO:  $157 \pm 11$  mmHg,  $n = 8$ ; 2K1C-HYP:  $158 \pm 11$  mmHg,  $n = 9$ ) than SHAM rats (SHAM-ISO:  $132 \pm 3$  mmHg,  $n = 6$ ; SHAM-HYP:  $134 \pm 2$  mmHg,  $n = 7$ ). There was no difference in average daily intake of water (SHAM-ISO:  $65 \pm 5$  ml; SHAM-HYP:  $67 \pm 6$  ml; 2K1C-ISO:  $64 \pm 5$  ml; 2K1C-HYP:  $54 \pm 5$  ml) or 0.3 M NaCl intake (SHAM ISO:  $7 \pm 2$  ml; SHAM-HYP:  $6 \pm 2$  ml; 2K1C-ISO:  $13 \pm 4$  ml; 2K1C-HYP:  $9 \pm 3$  ml) between groups. Gastric retention was higher ( $p < 0.05$ ) in SHAM-HYP ( $30.7 \pm 2.1\%$ ) vs. SHAM-ISO ( $21.2 \pm 2.3\%$ ); there was no difference in gastric retention between SHAM and 2K1C rats (2K1C-ISO:  $25.0 \pm 3.3\%$ ; 2K1C-HYP:  $24.2 \pm 0.7\%$ ). Therefore, 2K1C rats showed in the 4th PSW gastric dysmotility unrelated with changes in the daily intake of either water or 0.3 M NaCl.

ID: 5167

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### EXPRESSION OF TUMOR MARKERS IN THE LIVER OF RATS EXPOSED TO DEXAMETHASONE IN UTERO AND SUBJECTED TO THE EXCESS OF FRUCTOSE INTAKE IN ADULT LIFE

Prenatal dexamethasone (DEX) associated with fructose consumption in adult life leads to hepatic metabolic disorders. HCC has been associated with NAFLD without underlying cirrhosis. Here, we investigated the expression of tumor markers in rats exposed to DEX in utero and subjected to excess

of fructose in adult life. Pregnant Wistar rats were treated or not with DEX (0.1mg/kg/day in drinking water) during the 3rd gestational period. Adult offspring (CTL and DEX) were assigned to receive 10% fructose in the drinking water (fructose and DEX-fructose) for eight weeks. Biochemical parameters were measured using commercial kits. Gene expression was analyzed by both real time RT-PCR and western blotting. Results were expressed as mean  $\pm$  SEM and analyzed by two-way ANOVA followed by Tukey post-test. The experimental protocols were approved by CEUA/UNICAMP (5530-1/2020). Offspring exposed to high fructose intake displayed increased triglycerides levels (CTL-fructose 163% and DEXfructose 173% of CTL;  $p=0.04$  and  $p=0.01$ ); cholesterol increased (128% of CTL;  $p=0.007$ ) and HDL decreased (68% of CTL;  $p=0.01$ ) in DEX-fructose rats; in parallel, mesenteric fat increased (157% of CTL;  $p=0.01$ ). Compared to CTL, DEX-fructose rats exhibited increased hepatic expression of Alpha Fetoprotein (AFP) (179%;  $p=0.009$ ) Proliferative Nuclear Cell Antigen (PCNA) (132%;  $p=0.04$ ) and Hepatocyte Growth Factor (HGF) (136%;  $p=0.03$ ). DEX-fructose rats also showed reduced expression of Insulin-likeGrowth Factor 1 (IGF-1) (62% of CTL;  $p=0.04$ ) and Hepatocyte Nuclear Factor 1 (HNF-1) (51% of CTL;  $p=0.01$ ). Our data confirm previous results showing the exacerbation of metabolic disorders that lead to hepatic steatosis and hypercholesterolemia in DEX-fructose rats. High levels of AFP, PCNA and HGF, and low levels of IGF-I are classical findings of HCC; downregulation of HNF-1 is also a marker of liver malignancies. Further investigations are required to establish the relevance of our findings.

ID: 5168

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### **O-GLCNACYLATION OF PROXIMAL TUBULE (Na<sup>++</sup>K<sup>+</sup>)-ATPase $\alpha$ 1 SUBUNIT IS ASSOCIATED WITH REDUCED SODIUM REABSORPTION IN DIABETIC KIDNEY DISEASE**

Diabetic kidney disease (DKD) is one major cause of progression of chronic kidney disease. One important characteristic of DKD is the tubular damage and dysfunction leading to alterations in renal Na<sup>+</sup> handling. Evidence points out the increased protein O-GlcNAcylation in tubular structures of DKD patients and animal models. Spite of changes in renal Na<sup>+</sup> handling, the potential role of OGlcNAcylation on modulation of sodium transporters in proximal tubule epithelial cells (PTECs) was not investigated yet. The aim of the present work was to investigate if O-GlcNAcylation modulates (Na<sup>++</sup>K<sup>+</sup>) ATPase in PTECs. Two models were used: 1) LLC-PK1 cells, a porcine PTEC line; and 2) streptozotocin (STZ)-induced Type 1 diabetic mice (STZ group). To study early stage of renal disease, animals after 4 weeks STZ injection were used (CEUA-043/18). For comparison among three or more experimental groups, one-way analysis of variance was used followed by the Newman-Keuls post-test ( $P<0.05$  was considered statistically significant). Using LLC-PK1 cells it was observed: 1) 5 mM glucosamine or 1  $\mu$ M Thiamet-G (TMG), inducers of intracellular OGlcNAcylation, promoted the inhibition of (Na<sup>++</sup>K<sup>+</sup>) ATPase activity in 40% ( $n=6$ ); 2) glucosamine and TMG promoted  $\alpha$ 1 subunit O-GlcNAcylation measured by co-immunoprecipitation ( $n=2$ ); 3) confocal analysis showed that increased OGlcNAcylation resulted in reduction of  $\alpha$ 1 subunit in cell surface ( $n=3$ ). We observed that STZ group presented increased the fractional excretion of Na<sup>+</sup> (FENa<sup>+</sup>) and increased total O-GlcNAcylation in renal cortex compared to control mice ( $n=4$ ). Together, our findings show that O-GlcNAcylation of PT (Na<sup>++</sup>K<sup>+</sup>)-ATPase  $\alpha$ 1 subunit leads to its internalization and reduction of enzyme activity what could be associated to the reduction of tubular Na<sup>+</sup> reabsorption in early stage of DKD.

ID: 5169

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### INVOLVEMENT OF THE NUCLEUS OF THE SOLITARY TRACT IN RESPIRATORY CHANGES OBSERVED IN AN EXPERIMENTAL MODEL OF PARKINSON'S DISEASE

Parkinson's Disease (PD) is a neurodegenerative disease characterized by loss of dopaminergic neurons in the pars compact of the substantia nigra (SNpc), leading to well-known motor symptoms. However, studies have shown that PD can also affect medullary respiratory areas, triggering basal and hypercapnia respiratory impairments. Few studies demonstrated that respiratory deficit in the PD during hypoxia is associated with neuronal loss in the commissural and intermediate areas of the nucleus of the solitary tract (cNTS or iNTS, respectively). Our aim was to investigate if: 1) dopaminergic neurons from SNpc project to NTSc and 2) the participation of iNTS and cNTS in respiratory deficits observed in the experimental model of PD induced by bilateral injection of 6-hydroxydopamine in the caudate putamen of male Wistar rats (weight between 300 and 350g). Ventilatory analyzes were performed by whole-body plethysmography. To investigate neuronal activation of NTS during hypoxia we used Fos protein as a neuronal activity marker, and for neuroanatomical study, we injected unilaterally the retrograde tracer Fluorogold into the cNTS (CEUA: 1856280120). Our data showed a reduction (PD x control) in respiratory frequency (fR) and ventilation (VE) at baseline by  $30.1 \pm 2.6\%$  and  $44.8 \pm 5.5\%$  respectively. We also observed a reduction in the hypoxia (8% O<sub>2</sub>) ventilatory response (PD x control) by  $36.0 \pm 0.7\%$  and reductions in Fos-activated neurons in the cNTS by  $82.3 \pm 1.9\%$  and iNTS by  $65.5 \pm 14.8\%$ . We did not observe direct inputs from SNpc to cNTS. However, there was direct inputs from periaqueductal gray matter to cNTS, raising the hypothesis that may exist an indirect dopaminergic pathway from SNpc to cNTS, suggesting that the defect in this pathway might explain a more pronounced reduction of Fos neurons in cNTS. Therefore, our data suggest that the impairment in the hypoxia ventilatory response is presumably related to the reduction in the number of neurons in the NTS.

ID: 5173

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### THE TRPA1 CHANNEL IS AN IMPORTANT PLAYER IN BROWN ADIPOSE TISSUE THERMOGENIC ACTIVITY

Environmental temperature is an important modulator of thermogenic activity in mouse brown adipose tissue (BAT). The Transient Receptor Potential A1 is a cold-activated cation channel. The natriuretic peptides, NPs, released in response to cold, increase the expression of Ucp1 and other lipid metabolism genes in BAT. To investigate the role of TRPA1 channels in the BAT thermogenic response to cold, C57Bl/6J (WT) and Trpa1 KO male mice were acclimated for 2 weeks at 29°C +1 (12:12 light/dark) and then subject to 22°C for 2 weeks or 10°C for 6 h, and compared to the thermoneutral group (29°C +1) (IBUSP CEUA 350). The plasma concentration of ANP and BNP, as well as the transcript levels of their receptors and thermogenic genes were measured. Gene expression was determined by the 2- $\Delta\Delta$ Ct method, and all data were analyzed by Two-way ANOVA. A 2-week 22°C treatment decreased the transcripts of Nprc receptor in WT mice and increased the expression of Nprb in Trpa1 KO mice compared to 29°C. Plasma levels of ANP and BNP at 22°C remained unchanged in Trpa1 KO or decreased in WT animals, compared with 29°C. However, in acute 10°C condition, plasma levels of BNP increased in both genotypes. After two weeks at 22°C, Trpa1 KO mice showed increased expression of Prdm16, Cidea, Cpt1 $\alpha$ , Lcad and Ucp1 but only Ucp1 and Lcad had increased levels in both genotypes. WT or Trpa1 KO mice displayed similar profile of core body temperature (Tc) oscillation at 30°C; immediately after 22°C exposure, Tc of Trpa1 KO mice increased compared to WT mice. Six hours after the beginning of cold-stimulus, Tc was restored to values found in WT group. In conclusion, chronic exposure to 22°C increased expression of thermoregulation-related genes more intensely in Trpa1 KO than in WT mice. Circulating NPs did not change at 22°C, but due to the increase of the clearance Nprc receptor and increase of Nprb expression, the NP pathway leading to thermogenesis was activated.

ID: 5174

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## ANXIOLYTIC EFFECT OF KEFIR SUPPLEMENTATION ON FEMALE RATS

Anxiety is characterized by feelings of tension, fear and worry, along with autonomic distress that can be persistent and decrease quality of life. Both disease severity and medication efficacy can suffer interference of life habits and nutrition. Probiotics are a wide group of microorganisms that cause benefits to a person when ingested in an adequate way. The probiotic of Kefir is a fermented dairy drink produced by the action of Kefir grain microflora, which have been reported to have anti-inflammatory and antidepressive actions, among others. Our objective was to test if milk Kefir (K) can produce an anxiolytic effect in female adult rats. Three-month old female Wistar rats ~250g were fed regular chow with addition of 3 ml of K by daily gavage for three weeks (n=7), while the control group (n=7) received 3 ml pasteurized milk (M), also by gavage. All rats were then submitted to the elevated plus maze and to the open field tests. Results were compared by the Student's T test and expressed as media  $\pm$  standard deviation. K supplementation caused a 93.9%  $\pm$  38.80 increase in time spent (p= 0.056), and a significant increase (90.9%  $\pm$  29.62; in entrance frequency in the open arms of the plus maze. There were no differences in the plus maze closed arms entrances (M: 7.1  $\pm$  2.0; K: 10.0  $\pm$  1.4) or in open field exploration (M: 98.9  $\pm$  25.4; K: 117.3  $\pm$  26.5 lines crossed - M: 23.1  $\pm$  8.2; K: 30.2  $\pm$  9.6 rearings). This result indicates an anxiolytic effect of kefir on female rats, which was not related to a locomotor alteration. This effect can be caused by a positive serotonergic modulation and/or an inhibition of the hypothalamus-pituitary-adrenal axis, both possibly linked to a gut bacteria selection. While tests are necessary to clarify the mechanism of action, it is possible that K ingestion might be effective as an alternate anxiolytic treatment or as an adjuvant combined with other drugs.

ID: 5176

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP)

### POST-INSPIRATORY ACTIVITY ELICITS BY ACTIVATION OF PHOX2B-EXPRESSING RETROTRAPEZOID NUCLEUS NEURONS DEPENDS ON THE INTEGRITY OF THE KÖLLIKER-FUSE REGION

Introduction: Considering that the retrotrapezoid nucleus (RTN) would be an important center in the central nervous system (CNS) involved in the maintenance and modulation of respiratory activity, we hypothesized that neurons in this nucleus would also be involved in the post-inspiratory phase of the respiratory cycle. Objectives: Here we performed pharmacogenetic manipulation (AAV-hM3D(Gq)-mCherry or AAVhM4D(Gi)-mCherry) in VGlut2-cre, Ai6 conscious mice to evaluate breathing parameters through whole body plethysmography under baseline conditions (normoxia: 21% O<sub>2</sub>) (CEUA: 1736120718). Results: Under baseline conditions, selective stimulation of RTN by intraperitoneal administration of CNO (90 µg/mL - 0.1 mL/animal) produced a long-lasting increase in respiratory frequency (fR), tidal volume (VT) and minute ventilation (VE), as well as reduction in the duration of the post inspiratory (TPI) phase. The increase in VT ( $3.3 \pm 0.47$  vs. RTN stimulation:  $5 \pm 0.39$  ml/kg) and VE ( $1108 \pm 201$  vs. RTN stimulation:  $1595 \pm 276$  ml/min/kg) were reduced in a condition of pharmacogenetic inhibition of Kölliker-Fuse (KF) glutamatergic neurons. The reduction in TPI ( $152 \pm 42$  vs. RTN stimulation:  $123 \pm 16$  ms) was prolonged after inhibition of KF neurons. After the inhibition of KF glutamatergic neurons, RTN stimulation produced a further increase in fR ( $416 \pm 36$  vs. RTN stimulation:  $284 \pm 23$  bpm). Conclusion: The phox2b-expressing RTN neurons seem to be involved in the modulation of respiratory activity and depend on the integrity of the glutamatergic neurons in the KF region.

ID: 5180

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### DIFFERENTIAL REGULATION OF PROTEIN SYNTHESIS IN GLYCOLYTIC AND OXIDATIVE MUSCLES IN MICE EXPOSED TO ACUTE THERMAL STRESS

The present study examined skeletal muscle type-dependent differences in the regulation of protein synthesis in response to cold. Specifically, two different techniques were used to estimate protein synthesis: 1) the incorporation of [(14)C] tyrosine (0.1 mM, 0.05 microCi/ml) into total proteins in isolated skeletal muscles and 2) the in vivo SURface SEnsing of Translation (SUnSET) methodology. Male C57/Bl6 8 weeks old mice were exposed to cold stress (4°C) or basal temperature (28°C) for 3h, and after

euthanasia, blood was collected, and EDL (glycolytic) and soleus (oxidative) muscles were harvested for biochemical, western blot, and RtPCR measurements. (CEUA 211/2016). Values were expressed as mean  $\pm$  SEM of 3-5 replicates per group, and analysis of variance (ANOVA) was used ( $p < 0.05\%$ ). Acute cold exposure increased plasma levels of corticosterone ( $\sim 2x$ ) but did not affect glycemia and insulinemia. In EDL, the rate of protein synthesis was significantly reduced by cold as estimated by both methodologies the incorporation of  $[(14)C]$  tyrosine ( $\sim 50\%$ ) and SUnSET ( $\sim 50\%$ ). This effect was accompanied by the higher gene expression ( $\sim 10x$ ) and protein content ( $\sim 6x$ ) of Redd1 (Regulated in DNA damage and development 1), a potent inhibitor of mTOR signaling and a well-known target of glucocorticoids. Consistently, cold stress inhibited the phosphorylation of the mTOR downstream protein S6 (75%) but not p-4EBP1. In soleus, cold exposure did not affect protein synthesis and the content of Redd1 but reduce the phosphorylation levels of S6 (75%) and 4EBP1 (50%). Neither soleus nor EDL showed changes in p-Akt (Ser473). These findings reveal differential responses in the regulation of protein synthesis and its related signaling pathways between EDL and soleus of mice exposed to cold and demonstrate that EDL muscles rapidly respond to this catabolic stimulus with reduction of protein synthesis through a mechanism involving activation of REDD1 and suppression of the mTOR pathway.

ID: 5181

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP)

## EXPRESSION OF DNA (DE)METHYLATION ENZYMES IN KIDNEYS OF TYPE 2 DIABETIC MICE

Diabetic kidney disease (DKD) is one of the complications associated with type 2 diabetes and has been identified as the main cause of end-stage renal failure. However, the molecular mechanisms that produce the morpho functional changes in the kidneys are still not completely understood. On that note, studies have shown that epigenetic modifications can lead to changes in gene expression and consequently contribute to the disease. We aimed to characterize the expression of epigenetic enzymes involved in the DNA methylation process (DNA methyltransferases, DNMTs), active demethylation (ten-eleven-translocation proteins, TETs) and proteins involved in the development and progression of DKD. Male wild type ( $n=6$ ) and BTBR ob/ob mice ( $n=6$ ) were observed for 14 weeks and their metabolic and urinary parameters were evaluated (Animal research committee approval number: 5348280918). The animals were placed in metabolic cages for 6 hours for urine collection and evaluation of creatinine concentration and urinary albumin excretion. At the end of the period, kidney tissue was harvested and later used for gene expression analysis. Our results showed an increase in body weight, fasting blood glucose, urinary flow and albuminuria, as well as a decrease in urine creatinine excretion in ob/ob mice in comparison to wild type littermates. We observed an increase in the transcript levels of Acta2 (encodes for alpha muscle actin) and a reduction in KI (encodes for klotho), markers of kidney injury. Regarding epigenetic enzymes, the expression of Dnmt1 transcripts in ob/ob mice was reduced in comparison to wild type mice, without changes in the transcript levels of Dnmt3, Tet1 and Tet3. In conclusion, our preliminary results showed that BTBR ob/ob animals develop progressive metabolic and kidney function alterations, changes in the expression of kidney injury markers and epigenetic enzymes.

ID: 5183

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal do Paraná (UFPR)

### **GLUCOSE METABOLISM IN ISOLATED INCUBATED SKELETAL MUSCLE OF OBESE-INDUCED-SMALL LITTER REDUCTION RATS**

Obesity is characterized by the excess of body mass and adipose tissue which increases the risk of developing early metabolic diseases such as insulin resistance (IR), type 2 diabetes, cardiovascular disease, and other metabolic disorders. The age glucose metabolism alteration begins is not known. Here we investigate in rats 60 days old, the glucose metabolism in skeletal muscle of obese-induced-small litter reduction rats. All animal protocols were approved by the Ethics Committee for Experimental A animals at Universidade Federal do Paraná. Two groups were set named control and small litter. Soleus muscles were rapidly and carefully isolated split longitudinally into two equal portions, weighed (20-30 mg) and pre-incubated for 30 min, in Krebs-Ringer bicarbonate buffer pre-gassed for 30 min with 95% O<sub>2</sub>/5% CO<sub>2</sub>, at 37°C containing 5.6 mM glucose, 1.5% BSA, pH 7.4. Then, the muscles were transferred to flasks that contained identical buffer plus 0.1 µCi/ml D-[U-14C]-glucose in the absence or presence of insulin (10 mU/mL). After incubation for 60 min, muscles were removed, blotted, and frozen in liquid nitrogen. Total lactate, radiochemical lactate, glycogen synthesis, and glycogen content were measured. Radiochemical lactate and total lactate were not different between the groups, as well as the glycogen content (p>0.05). Glycogen synthesis was significant reduced at 100µU/mL in the obese group (p<0.05). Our results suggest, in this obese animal model, an alteration in glucose metabolism, starting at 60 days old, on glycogen synthesis.

ID: 5184

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **THE ROLE OF VOLTAGE-GATED POTASSIUM CHANNELS IN THE CONTROL OF ELECTROPHYSIOLOGICAL PROPERTIES OF DMV PARASYMPATHETIC RESPIRATORY MOTONEURONS OF RATS**

The Dorsal Motor Nucleus of the Vagus (DMV) is involved in a series of physiological process by the parasympathetic autonomic control. The DMV parasympathetic respiratory motoneurons (PRMNs) project to lower airways and may regulate the smooth muscle tone and mucus secretion. The voltage-gated potassium channels (Kv) regulate the electrophysiological properties in a diversity of neurons and motoneurons, however the contribution of Kv in the control of the excitability and action potential waveform of DMV PRMNs is still unclear. Herein we investigated the contribution of Kv in the control of DMV PRMNs excitability and action potential waveform. Using coronal slices of the brainstem from male Wistar-Hannover rats (3 weeks), we associated intracellular recordings, using whole cell patch clamp, with retrograde labelling of DMV PRMNs. Tetraethylammonium chloride (TEA; 5mM) was used as specific blocker of Kv. All procedures were approved by the institutional Ethics Committee of on

Animal Use (CEUA, 087/2019). Data are expressed as mean  $\pm$  SEM. We first evaluated the K<sup>+</sup> currents mediated by K<sub>v</sub>, sensitive to TEA, in voltage clamp mode in the DMV PRMNs (534.9 $\pm$ 156.8 pA). In current clamp mode, TEA increased the number of action potentials (ramp protocol: 17.91 $\pm$ 1.44 vs 13.64 $\pm$ 1.16, p=0.0009; square pulse protocol: 27.81 $\pm$ 2.02 vs 19.81 $\pm$ 2.03, p<0.0001) in response to positive current injections. Additionally, TEA increased the action potential half-width (3.09 $\pm$ 0.23 vs 1.77 $\pm$ 0.05 ms, p<0.0001), but did not affect the action potential amplitude (73.85 $\pm$ 2.32 vs 70.92 $\pm$ 3.58 mV, p=0.19), the amplitude of afterhyperpolarization potential (29.49 $\pm$ 1.68 vs 28.03 $\pm$ 1.75 mV, p=0.19) and the depolarizing input resistance (0.03 $\pm$ 0.002 vs 0.03 $\pm$ 0.002 G $\Omega$ , p=0.63). We conclude that K<sub>v</sub> play a critical role in the regulation of excitability and action potential waveform of DMV PRMNs of rats.

ID: 5185

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **ACTIVE LEARNING OBJECTS: THE USE OF CLINICAL CASES AS FACILITATORS OF THE TEACHING-LEARNING PROCESS OF RESPIRATORY SYSTEM PHYSIOLOGY DURING REMOTE TEACHING**

Active learning increases the engagement of the students contributing to knowledge construction. A strong base in Animal Physiology is essential for understanding diseases and their clinical presentation, especially in Veterinary Medicine. Due to the global COVID-19 pandemic, emergency remote teaching (ERT) was developed worldwide. To increase the engagement of the students and their comprehension of respiratory physiology during the ERT, we developed a learning activity (LA) using clinical cases. After Respiratory Physiology lectures, the students (n=33) who signed the agreement to participate in this research answered a pre-test with 10 objective questions about the classes. Then, the students were divided into groups, and each group received a different clinical case that was studied for 30 min to be presented to their classmates. After the presentations and discussion, the students answered a post-test (identical to pre-test) and a perception questionnaire about this LA, with 23 questions. Data were submitted to Student's t-test and p<0.05 was adopted as a significance level. This study was approved by UFRGS ethical committee (CEP n° 39182). The students' performance in two questions related to interpretations of clinical cases in the post-test increased by 117% and 96%. In the perception questionnaire, the students' answers were: 81% said that they liked to study; 50% consider that this LA was positive for learning; 81% could associate theory with practice due to this LA and 77% said that LA is better in normal than in remote classes. The application of this LA was considered efficient in the ERT and well accepted by the students. Most students consider this LA positive due to the demand for clinical practice during graduation and future professional performance. Thus, this type of LA with the association of theory and practice using clinical cases seems to be efficient for the teaching-learning process according to Veterinary Medicine students.

ID: 5186

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### **PRELIMINARY ANALYSIS OF FATTY ACIDS EFFECTS IN THE EXPRESSION OF INFLAMMATORY CYTOKINES AND NUTRIENT TRANSPORT CONTENTS IN MICE SMALL INTESTINE**

The high-fat diet (HFD) reduces the content of carbohydrate (GLUT2), peptide (PEPT1) and lipid transporters (FAT/CD36 and NPC1L1) in the intestine of mice. The most abundant fatty acids in HFD are palmitic acid (PA), stearic acid (EA) and oleic acid (OA), which also exert regulatory actions in the inflammatory process. Studies showed that cytokines interfere with the gene expression of some nutrient transporters, which led us to hypothesize that there is a correlation among HFD consumption, high cytokines levels and reduced nutrients transporters amount in the intestine. For checking this issue, we evaluated whether the PA, EA e OA administration mimics the HFD-reducing effects on GLUT2, PEPT1, FAT/CD36 and NPC1L1 contents in the intestine and the gene expression of cytokines (TNF- $\alpha$ , IL-1 $\beta$ , IFN- $\gamma$ ). Male C57BL/6 mice, 8 weeks / 23 grams, were distributed into four experimental groups: (1) Control (12% glycerol/8% BSA); (2) OA (160 mg); (3) PA (80 mg) and (4) EA (40 mg) - CEUA: 7285240320. The doses of fatty acids correspond to the same quantity ingested by mice feeding an HFD. Fatty acids were administrated by gavage, every day, for 21 days. The last corresponds to the time that a HFD decreased the nutrients transporters in the intestine. The expression of cytokines (TNF- $\alpha$ , IL-1 $\beta$ , IFN- $\gamma$ ) was analyzed by Real Time PCR and the content of nutrient transporters was evaluated by Western blotting. The main findings of fatty acids compared to control are: PA seems to reduce the FAT/CD36, NCP1L1, PEPT1 and GLUT2 contents; PA and EA increased the IFN- $\gamma$  expression; PA, EA and OA decreased TNF- $\alpha$  expression; IL-1 $\beta$  was not regulated by fatty acids. Our preliminary data (n=1-2) suggest that PA mimics the HFD effects on the nutrient's transporters, which might be associated with high IFN- $\gamma$  levels in the small intestine.

*ID: 5196*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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### **PREAUTONOMIC AREAS EXHIBIT BLOOD-BRAIN BARRIER LEAKAGE IN SHR: EFFECTS OF EXERCISE TRAINING**

We showed previously that exercise training (T) corrected both increased blood-brain barrier (BBB) leakage and autonomic dysfunction. There is no information on the mechanism(s) conditioning the normalization of BBB function. We investigated now whether T could modify the transcytosis and/or paracellular transport across the capillary endothelium. SHR and Wistar rats were allocated to T or sedentary (S) protocols. Hemodynamic/autonomic parameters and BBB permeability (fluorescent Rhodamine-70kDa+FITC-10kDa dyes given ia) were recorded. The paraventricular hypothalamic nucleus (PVN) was harvested and processed for immunofluorescence and transmission electron microscopy. Ethical approval CEUA 93/2017. SHR-S vs Wistar-S exhibited augmented systolic AP (SAP) and reduced pulse interval (PI) variabilities, decreased spontaneous baroreflex sensitivity (BrS), increased PVN BBB leakage (11.4 $\pm$ 0.6 vs 3.48 %area) and augmented transcytosis (8.1 $\pm$ 1.2 vs 4.8 $\pm$ 0.8 vesicles/capillary) but no change in tight junctions (TJ) expression. SHR-T showed resting bradycardia and a partial AP reduction (-9%)

accompanied by normalization of both BBB leakage ( $3.6 \pm 1.5$  %area) and transcytosis ( $3.8 \pm 0.7$  vesicles/capillary), and increased TJs' extension (60% occupancy of capillary borders). Hypertension- and T-induced transcytosis changes were confirmed by caveolin-1 immunofluorescence (SHR-S= $139 \pm 11$ , Wistar-S= $86 \pm 8$ , SHR-T= $81 \pm 6$  arbitrary units). There were significant positive correlations between the number of transcytotic vesicles x PVN BBB leakage ( $Y=1.77x-3.46$ ,  $r^2=0.722$ ,  $P<0.001$ ) and BBB leakage x SAP variability ( $Y=2.30x+16.6$ ,  $r^2=0.246$ ,  $P<0.001$ ). Data indicated that PVN BBB dysfunction in hypertension is due to increased transcytosis without changes in the paracellular pathway. Training ameliorates SHR's autonomic control by normalizing transcytosis, with an additional TJs structure improvement.

ID: 5198

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **INCREASED DISTAL OVER ACTIVATION OF GASTROCNEMIUS MEDIALIS PERSIST FOLLOWING ONE-YEAR OF ACHILLES TENDON REPAIR**

Persistent plantar flexion weakness is observed in long-term post Achilles's tendon (AT) repair surgery. The rehabilitation is complex and the mechanical properties of tendon are not recovered even after 2 years. Functional impairments may relate to altered gastrocnemius medialis (GM) structure, but its relationship with GM activation remains unclear. No information about regional activation for the GM, a muscle that contributes for ~45% of the total plantar flexion moment, is available. Here, we determine whether plantar flexion weakness in patients one-year after AT repair relates to altered neuromuscular activation patterns of the GM. This cross-sectional and case-control study included 10 middle-aged men with high ATRS score and submitted to traditional physiotherapy for one-year after AT repair (age  $34 \pm 7$  years-old, BMI  $27.3 \pm 2.8$  kg/m<sup>2</sup>, ATRS  $92.5 \pm 11.8$  pts., and time of evolution of  $12.9 \pm 1.1$  months) and ten healthy control men (age  $28 \pm 9$  years-old, and BMI  $27.5 \pm 3.7$  kg/m<sup>2</sup>) with protocol No.201904. All performed maximal and submaximal (40, 60 and 90% of the maximal voluntary isometric contraction) voluntary isometric plantar flexion contractions on an isokinetic dynamometer. Plantar flexor peak torque was recorded. The electromyography (EMG) activation and the regional activation in GM were recorded using a linear array electromyography (16-electrodes). The whole EMG activation between the groups and the clustered regional activation of the GM from the differentiated maps of activation between groups was compared. Furthermore, the location of the activation of a differentiated map between groups was described. We found higher EMG intensity of GM in the AT repaired group for plantar flexion at 90% ( $84.3 \pm 4.7\%$ ) compared to controls ( $71.2 \pm 9.2\%$ ,  $\Delta = 13.1\%$ ,  $p = 0.001$ ). As the intensity of contraction increased, more distal regions of the GM were more active. We conclude that individuals with plantarflexion weakness following an AT repair increase the distal activation of the GM during different isometric levels of plantarflexion. The distal activation in a novel result probably related with a low capacity of force transmission at the muscle-tendon interface. These results reveal a regional distribution adaptation of the nervous system as well as a risk factor of overload for futures muscle-tendinous injuries.

ID: 5200

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual Paulista (UNESP)

### **EFFECT OF MK-801, NMDA GLUTAMATERGIC RECEPTOR AGONIST, ON RAT FOOD INTAKE**

The MK-801 is a useful tool for investigating mechanisms that produce behavioral sensitization involving, for example, nociception. Preliminary experiments from our laboratory indicate that MK-801 also exerts a potent inhibitory effect on sodium appetite. The aim of the present work was to investigate whether intraperitoneal (ip) injection of MK-801 can also inhibit hunger for food chow. Adult rats ( $n = 10$ ) deprived only of laboratory chow for 24 h received a counterbalanced ip injection of MK-801 (0.15 mg/kg) or vehicle fifteen minutes before the start of the hunger test with no water available. The MK-801 vs. vehicle transiently inhibited food intake by 36% ( $3.7 \pm 1.0$  g vs.  $5.8 \pm 0.5$  g;  $p < 0.05$ ) only at 30 minutes of the test. Both groups ingested approximately  $8.0 \pm 1.0$  g at the end of the test (120 minutes, with asymptote at 60 minutes). These results contrast with those of previous experiments when we observed a persistent average 75% inhibition exerted by MK-801 on 0.3 M NaCl intake from the beginning to 60 minutes of the sodium appetite test. They suggest that the inhibitory effect of MK-801 on ingestive behavior does not result from general non-specific inhibition of behavior.

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Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **EDUCATIONAL CARD GAME TO REINFORCE LEARNING OF MOVEMENT DISORDERS AND SPINAL SYNDROMES**

Neurophobia is a global phenomenon defined as an aversion to the neurological sciences. Many students attributed this to a teaching gap between basic neuroscience and neurology. In this sense, active teaching methodology, such as educational games, has been encouraged as a teaching tool, complementing traditional methods. This study aimed to elaborate an educational card game to assist the learning process of movement disorders and spinal syndromes. A literature review was performed to search the clinical manifestations of these disorders and to raise ideas to develop the game. Cards were created and separated into two packs: Lesions Cards (composed of different movement disorders and Spinal Syndromes) and Manifestation Cards (composed of clinical manifestations of these disorders or syndromes). We used the "Card Creator" application to create the design of the cards with images obtained from the internet and books. Rules were created to instruct students on how to play the game. Hence, a card game was designed for three to six players in which the objective is to combine the Manifestation Cards with the respective Lesion Cards. Firstly, a student must be chosen as the judge to check if the cards are correctly matched. Secondly, the Lesion Cards must be placed face up on the table and Manifestation Cards must be shuffled and placed face down to form a pile. At the start, each

player draws a Manifestation Card from the pile and must correctly match with the Lesion Card. Turn order is in clockwise order. The purpose is to form columns of overlapping Manifestations Cards on the Lesion Cards. When all Manifestation Cards are correctly combined, the game ends. Therefore, it is possible to create a playful educational game to complement the teaching of movement disorders and spinal syndromes, reducing the gap between neurophysiology and neurology. The intention is to employ this methodology in neurophysiology classes to help students develop meaningful learning.

ID: 5211

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **ANGIOTENSIN-(1-7) IMPROVES CARDIAC LEFT VENTRICULAR BIOENERGETICS AND MITOCHONDRIAL FUNCTION IN A RAT MODEL OF NEONATAL HIGH OXYGENINDUCED CARDIOMYOPATHY**

Preterm birth (PT) results in ex utero development of an immature myocardium and increases the risk of cardiovascular diseases. Besides, angiotensin (Ang) II contributes to cardiac alterations induced by transient neonatal exposure to hyperoxia in a rat model of PT, resulting in oxygeninduced cardiomyopathy (OIC). We here postulated that OIC impaired left ventricular (LV) bioenergetics can be reversed by Ang-(1-7). Male Sprague–Dawley pups (Protocol 2020-2539) were kept in 80% O<sub>2</sub> from day 3 (P3) to P10 of life (OIC) or room air (Ctrl). At P22, osmotic minipumps with Ang-(1-7) (24 µg/kg/h) were implanted. At P28, cardiac echo was performed and at P34 rats were euthanatized and the LV was sampled. Results are mean ± SEM; Ctrl vs OIC vs OIC Ang-(1-7), one-way ANOVA with Fisher (n=6/group. P<0.05). The treatment with Ang-(1-7) improved LV ejection fraction (75±4 vs 65±3 vs 70±2%) and fractional shortening (45±4 vs 37±2 vs 40±1%). Ang-(1-7) increased the oxygen consumption rate (228±12 vs 187±15 vs 243±25 nmol O<sub>2</sub>/mL/mg protein) during the oxidative phosphorylation (state 3), and the LV protein expression (relative to GAPDH) of mitochondrial electron transport chain complexes III (1±0 vs 0.6±0.05 vs 0.86±0.13), and V (1±0 vs 0.67±0.03 vs 0.95±0.03). The gene expression of citrate synthase increased (0.93±0.02 vs 1.11±0.07 vs 0.87±0.05), and hexokinase decreased (1.04±0.12 vs 1.76±0.28 vs 1.01±0.23). Ang-(1-7) reduced ACE (0.88±0.2 vs 1.87±0.31 vs 1.08±0.14) and AT2 (0.90±0.15 vs 1.43±0.08 vs 0.93±0.07) mRNA compared to OIC, and the decrease in MasR (1.98±0.29 vs 0.86±0.21 vs 2.03±0.21). Ang-(1-7) increased SOD2 (1±0 vs 0.68±0.13 vs 0.94±0.07) and decreased catalase (1±0 vs 1.51±0.2 vs 0.81±0.15). The Ang-(1-7) treatment of rats exposed to neonatal hyperoxia prevents LV dysfunction and restores LV mito function, modulating the RAS and the antioxidant system. This study identified a potential therapeutic target for impaired cardiac function observed in individuals born PT.

ID: 5212

Área: Fisiologia Comparada

Forma de Apresentação: Ê-POSTER

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### **MOBILIZATION OF INTRACELLULAR CALCIUM MODULATES THE EFFLUX ACTIVITY OF ABC PROTEINS**

Membrane transport proteins belonging to the ABC superfamily (ATP-binding cassette) are nonspecific ATPases located in the cell membrane, recognized primarily for extrusion of xenobiotics and modulating the concentration of intracellular toxins in cells. By coupling the energy of ATP hydrolysis, ABCs transport a wide variety of substances with cytotoxic potential from the cytosol to the extracellular environment, acting as true efflux pumps. Concerning its characterization, there is strong evidence regarding gene expression, location, and function. However, the signaling pathways that regulate the activation of these pumps remains in dispute. This study evaluates whether oscillations of calcium ion ( $\text{Ca}^{2+}$ ) and increased activity of calcium-dependent protein kinases (PKC) could alter the level of efflux activity of ABC transporters in the ZF-L line (zebrafish hepatocytes). The cells were kept in culture bottles at 28°C (in RPMI and L15 medium, enriched with fetal bovine serum and antibiotic + antimycotic). The experiments were performed in 96-well plates, at a concentration of  $2 \times 10^5$  cells/mL. For each experimental condition, 5 replicates were used, with 4 to 6 independent experiments being performed. The cells were exposed to conditions of low  $\text{Ca}^{2+}$  ( $\text{Ca}^{2+}$  free medium with EGTA, 10mM Dantrolene and 5 $\mu\text{M}$  Bapta-AM), high intracellular availability of  $\text{Ca}^{2+}$  (20mM Caffeine) and PKC activation (200mM PMA); the efflux rate was measured using the Rhodamine B assay. The results were submitted to Student's t test. Caffeine 20mM and PMA 200mM exhibited a higher efflux rate (68% and 33%, respectively) compared to the control group. Both results suggest that the increased intracellular availability of  $\text{Ca}^{2+}$  is related to the increase in the activity level of ABC transporters, pointing to phosphorylation via PKC as a possible constituent of the ABC activation signaling pathway.

*ID: 5213*

*Área: Fisiologia Comparada*

*Forma de Apresentação: Ê-POSTER*

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### **TRANSLOCATION OF AQP1 IN THE SHRIMP PALAEMON ARGENTINUS MUSCLE CELLS**

The molting cycle of crustaceans are a major physiological challenge. Water channels (aquaporins/AQP) are essential for the uptake of water during pre-molt and post-molt. The increased expression of AQPs seems to be responsible for cell/tissue swelling, which is necessary for crustaceans' successful growth. We investigated hyposmotic shock and  $\text{Ca}^{2+}$  as agents for the rapid translocation of AQP1 to the membrane of a freshwater shrimp's abdominal muscle cells. We evaluated cell volume, intracellular  $\text{Ca}^{2+}$ , and used immunocytochemistry to analyze the translocation of AQP1 in two molt stages. For statistical analyses, we used Unidirectional Repeated Measurement Analysis, T-test and One-way ANOVA (3-4 cells / 3-8 animals). In hyposmotic saline, the animal cells in pre-molt and post-molt increased volume by 20% and 50% respectively ( $p < 0.001$ ). Similarly, the cells of the pre-molt animals submitted to hyposmotic conditions with high  $\text{Ca}^{2+}$  (HC) swelled by ~50% ( $p < 0.001$ ). We observed an intracellular  $\text{Ca}^{2+}$  increase in the cells in hyposmotic and in HC ( $p < 0.05$ ). In the translocation analysis by confocal microscopy, the expression of AQP1 in the cells of pre-molt animals in isosmotic and hyposmotic saline presented a linear profile, indicating a uniform distribution of AQP1 between the cell membrane and the intracellular region. In cells submitted to HC, the profile showed an initial peak of fluorescence, followed by a plateau and a final peak, indicating the translocation of AQP1 from the cytoplasm to the

cell membrane. The same was observed in post-molt cells. This study shows that hyposmotic conditions and an elevation of intracellular and extracellular Ca<sup>2+</sup> concentrations are concurrent with the movement of AQP1 to the plasma membrane. Hemolymph dilution and naturally occurring Ca<sup>2+</sup> fluxes, which lead to AQP translocation, may be an advantageous mechanism for molting.

*ID: 5214*

*Área: Fisiologia do Exercício*

*Forma de Apresentação: Ê-POSTER*

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### **DOES PLYOMETRIC EXERCISES CAUSE DAMAGE TO THE BICEPS FEMORIS TENDON IN MALE RECREATIONAL ATHLETES?**

Plyometric exercise-induced muscle damage has been observed over time due to the rapid movements and force production. In the transition from eccentric to concentric phases, high mechanical demand is placed on the knee flexors, and therefore producing muscle-tendon unit damage. However, the effects of plyometric exercise-induced tendon damage on knee flexors remains unclear. Therefore, we determine the acute effect of plyometric exercises on biceps femoris (BF) tendon damage. We conducted a clinical trial (NCT04273971) including 10 young physically active males (age: 25±3 years old, body mass: 79±10 kg, and height: 175±5 cm; Ethical approval: 96793518.3.0000.5323). On day one, they completed a 40-min plyometric exercise session including vertical, box, half-squat, high (straight up), bounding, and drop jumps (3 series/15 rep) and a 10-m sprint battery (3 series/8 rep). Rate of perceived exertion (RPE, 0-10 points) was assessed immediately post-session. Tendon damage was evaluated before, immediately after, and 48 h after session using longitudinal ultrasound images (40mm probe, 7.5 MHz) of the preferred leg. The mean grayscale value (increase indicating tendon damage) was measured using Image-J software. At 48 h post-exercise, pain was assessed using a 10-cm visual-analog scale while participants walked down a step. Generalized estimating equations were performed to verify time effect, followed by Bonferroni pairwise comparisons ( $p < 0.05$ ). Average RPE was 9±1 points, while mean pain 48 h post-session was 4±3/10 points. Plyometric exercise-induced BF tendon damage increased immediately after exercise ( $p < 0.001$ , 75.3±2.4 to 79.2±2.0 a.u.). After 48h, damage did not differ from baseline ( $p = 0.852$ , 77.2±3.1 a.u.). A distinct difference on damage behavior was identified between baseline and immediately after exercise, which decrease to baseline values within 48h. Tendon acute alterations after exercises need to be considered for plyometric exercise prescription.

*ID: 5215*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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## INCREASED ALPHA WAVES IN THE ANTERIOR CEREBRAL QUADRANTS IN WOMEN WITH FIBROMYALGIA

Fibromyalgia (FM) is a syndrome characterized by diffuse chronic musculoskeletal pain associated with psychosomatic disorders, which main pathophysiological hypothesis is the hyperexcitability of neural circuits. Electroencephalography is a technique that directly measure neural activity and detect brain dysfunctions, including those related to pain. However, few studies investigate these mechanisms in FM. Thus, the aim of this study was to investigate the relative amplitude by quadrants of alpha brain waves in women diagnosed with fibromyalgia. This observational cross-sectional case control study, approved by the ethics committee under the opinion of the CAAE- 97669018.6.0000.5546/2.897.520, evaluated 40 volunteers divided into two groups: fibromyalgia group (F)(n=20) (47.4±14.19 years) and healthy control group (C)(n=20) (45.40±11.07 years). The volunteers were evaluated using a 21-channel electroencephalogram, positioned in the classic 10/20 system, with a sampling rate of 600Hz. The EEG protocol consisted of a 5-minute recording with eyes closed. After showing the normal distribution of data through the Shapiro Wilk test, a comparison between groups was performed using the unpaired student test. The electrophysiological analysis indicated greater relative amplitude of alpha waves (8-12Hz) in the right anterior brain quadrants (F=23.66±3.46; C=21.09±3.08) and left anterior (F=23.71±3.55; C=21.47±2.14) ( $p \leq 0.05$ ). The posterior quadrants did not show differences between groups. Changes in brain activity to high frequency waves, such as alpha, have already been reported in the literature in involvement in various painful diseases and it appears that this is also the case for FM. The predilection for the anterior cerebral region in the most intensified form in the right hemisphere evidenced in this work may represent a modification of the allostatic reference produced by the chronicity of the painful sensation produced by maladaptive neuroplastic alterations.

ID: 5216

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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## EVALUATION OF THE ROLE OF 5- HYDROXYTRYPTAMINE (5-HT) IN THE RESPONSE OF MACROPHAGES OBTAINED FROM MICE INOCULATED WITH *Staphylococcus aureus* and *Escherichia coli*

Serotonin is known as an important modulator of immune responses through the action of the serotonergic system. 5-HT acts on immune cells, coordinating the responses of macrophages, Natural killer (NK) cells, dendritic cells and lymphocytes, either in a stimulating or suppressive way. This immunomodulatory role occurs mainly in cells with pro-inflammatory action. However, its effect is still not well understood. Thus, the aim of the study is to evaluate the effect of 5-HT on the immune response induced by the inoculation of *Staphylococcus aureus* and *Escherichia coli* in cultures of peritoneal and splenic macrophages from mice treated or not with this hormone. The mice used belong to the Balb/C lineage, with aged between six and eight weeks. This study was approved by the Ethics Committee in Animal Research-CEUA (No. 090/2020). These animals will be divided into two groups, treated in vivo and Sham. All animals will undergo a surgical process, where it will be possible to receive intracerebroventricular injections (ICV). In the treated group the individuals will receive a solution containing 5-HT, in the Sham group it will be injected with a 0.1% ascorbic acid solution. Peritoneal macrophages and spleen will be collected and isolated from all animals. The Sham group will be divided into two subgroups, those treated with

5-HT in vitro and those not treated. The cells will be inoculated with *E. coli* and *S. aureus* for 3 and 6 hours. Then, the dosage of cytokines TNF- $\alpha$ , IL-1 $\beta$ , IL-6, IL-8, IL-13 and IL-10 and reactive oxygen species and nitric oxide dosage will be performed. With the results, it is expected to better clarify how 5-HT influences the immune response after infection of microorganisms, so that this comparative study elucidates the effects of this process.

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Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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Instituições: *Universidad de Chile*

### **THEORETICAL STUDY OF THE INTERACTION OF ANGIOTENSIN-(1-7), ANGIOTENSIN-(1-9) AND THEIR RETROENANTIOMERS WITH NON-CANONICAL AXIS AT2/MAS RECEPTORS**

The non-canonical axis of the renin-angiotensin-aldosterone system (RAAS) plays an important role in the regulation of blood volume and blood pressure. This axis implicates angiotensin-converting enzyme 2 (ACE2) and the AT2 (AT2R) and Mas (MasR) receptors. Several studies show that activation of AT2R and MasR by Angiotensin-(1-9) and Angiotensin-(1-7) peptides, respectively, confer anti-hypertensive properties and vasodilator and cardioprotective effects at the preclinical level. However, Ang-(1-9) and Ang-(1-7) are relatively easily degraded in vivo. Therefore, it is of fundamental relevance to evaluate their retroenantiomers (REs) as a design for new drug derivatives with anti-hypertensive properties and the potential to exhibit greater stability. Currently, there are no theoretical-computational studies that allow us to determine the binding characteristics of Ang-(1-9) and Ang-(1-7) to their receptors, nor what types of binding are unique to these peptides and make them unique to AT2R and MasR. Based on this background, and by docking and molecular simulation, the energetic binding affinity between Ang-(1-9) and Ang-(1-7) and their REs with their respective receptors were determined, and the intermolecular interactions that contribute to the stabilization of the complexes were characterized. For MasR, a homology model was built, using the AT2 and C5 $\alpha$  receptor crystals as templates, where 1000 models were generated and the optimal model was selected according to its potential energy. Subsequently, docking and molecular simulation studies were performed between Ang-(1-9) and Ang-(1-7) and their respective REs, showing a high binding affinity of Ang-(1-9)/AT2R (-9.5 kcal/mol), RE-Ang-(1-9)/AT2R (-10.0 kcal/mol), Ang-(1-7)/MasR (-9.3 kcal/mol), and RE-Ang-(1-7)/MasR (-9.4 kcal/mol). These results may be associated with the high proximity and formation of hydrogen bonds with the key residues of MasR and AT2R responsible for their interaction with these peptides.

ID: 5218

Área: *Neurofisiologia*

Forma de Apresentação: *Ê-POSTER*

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## **DIFFERENCES IN THE MEASUREMENT OF DELAYED ONSET MUSCLE SORENESS WITH DIFFERENT TOOLS IN WOMEN AND MEN**

The practice of physical exercise can induce delayed onset muscle soreness (DOMS). DOMS is characterized by a painful, stiff feeling that appears when the muscles are stretched or palpated. It starts from 6 to 12 h after exercise, with peak values usually occurring from 48 to 72 h. DOMS reduces joint range of motion and strength, affecting performance of daily tasks. The aim of the study was to compare different methodologies for assessing exercise-induced delayed onset muscle soreness in men and women. This study was approved by the local institution ethics committee (CAAE 96793518.3.0000.53230). The perceived pain and the pain pressure threshold were compared between 11 men and 15 women (25 years old, body mass of 66 kg, and height of 167 cm), at three moments: before, immediately after, and 48h after DOMS induction in the muscles rectus femoris and vastus lateralis. DOMS was induced by 1-minute maximal squats sets with bodyweight, at the highest possible speed, with 15-second intervals between each set, until exhaustion. Pain pressure threshold was assessed using a digital algometer, and perceived pain was assessed using a visual analog scale (VAS). Men had higher pain pressure threshold for the vastus lateralis and rectus femoris before ( $p=0.004$ ,  $p=0.018$ , respectively), immediately after ( $p=0.003$ ,  $p=0.004$ ), and in 48 h after exercise ( $p=0.002$ ,  $p=0.001$ ). VAS results did not differ between men and women. The greater pain sensitivity in women was observed only for pressure pain threshold. We conclude that differences in DOMS between men and women are detected by pain threshold measurements, but not with the use of a subjective scale like the VAS.

ID: 5219

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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## **EXTRACELLULAR MATRIX STRUCTURE AND RECELLULARIZATION OF *RATTUS NOVERGICUS* KIDNEYS**

Chronic kidney disease consists of kidney damage and progressive, irreversible loss of kidney function. As replacement renal therapy for advanced stages there are dialysis and kidney transplantation, but high costs, biocompatibility and insufficient supply of organs are still obstacles. Therefore, new techniques have been studied by regenerative medicine, based on tissue engineering technology, to provide alternative treatments. For the study, female Wistar rats through the ages of 12 to 30 weeks and weighing between 250-400g were used. Total laparotomy was performed to perform the left renal vein puncture. The scalp was connected to a peristaltic pump with flow control to start the decellularization process. The detergents sodium dodecyl sulfate (SDS), Triton x-100 and Tween 20 were tested through 25 hours for the production of the extracellular matrix (ECM). Finally, the ECM was perfused with ultrapure water for 90 min for complete removal of the detergent. The ECM of the right kidney was destined to fixation for histological analysis and the left kidney was destined to the recellularization process. SDS showed better decellularization efficiency. A reduction of 86% of the glycosaminoglycan (GAG) content was demonstrated compared to the control kidney. Collagen and elastin proteins were morphologically preserved when analyzed by histochemical technique. In addition, the proximal tubule cell line LLCPK-1 was able to adhere to MEC with little proliferation. The work sought to obtain preserved ECM with potential to serve as a substrate for the production of recellularized renal tissue. The work established an efficient protocol for the production of viable ECM for the process of cell adhesion and proliferation.

ID: 5220

Área: *Fisiologia Comparada*

Forma de Apresentação: *Ê-POSTER*

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**ACUTE CHANGES FROM PREFERRED TO UNPREFERRED TEMPERATURES IMPAIR THE BAROSTATIC REFLEX IN A NEOTROPICAL TELEOST, THE TRAHÍRA (*HOPLIAS MALABARICUS*)**

Thermal tolerance in fish seems to be associated to their ability to sustain aerobic metabolism, and for that, adequate tissue perfusion is essential. The baroreflex is the main regulator of arterial pressure and tissue perfusion in vertebrates, and little is known about the influence of temperature (T) on its function. Thus, we aimed to investigate the effects of acute T changes on the baroreflex of *Hoplias malabaricus*. Mature unsexed fish (234±28g) were fitted an aortic cannula to acquire mean arterial pressure (MP) and pulse interval (PI). After 24h at 25°C, water T was changed to 15, 25 or 35°C (N=5 each), and animals were kept for 12h after stabilization. MP and PI were recorded for 30min in untreated state and after infusion of atropine and propranolol (2mg/kg each). Animals' spontaneous baroreflex were assessed using 400 heartbeats, sequences of ≥3 beats, 1 beat delay, and thresholds of >.005kPa and s. Variables were compared via RM (treatment) 2-way ANOVA and Fisher's test (P≤.05). Ethics Committee 02.0107.2019/225.2020. Results in mean ± SEM. At 25°C fish showed a MP of 4.3±0.5kPa, PI of 1.2±0.1s, and baroreflex gain (BG) of 443.2±96.1% of untreated PI/kpa. At 15°C, fish exhibit similar MP (3.9±0.2), higher PI (2.6±0.3), and lower BG (172.6±26.2). At 35°C, MP (4.1±0.5) and PI (0.7±0.1) did not change significantly, while BG (288.6±98.4) decreased. After the administration of atropine and propranolol, MP remained unchanged (4.4±0.4, 4.1±0.5 and 3.8±0.7 at 25, 15 and 35°C), while BG decreased at 25 (86.0±36.3) and 35 (69.2±34.1), but not at 15°C (35.0±10.2). PI, on the other hand, decreased at 15 (2.1±0.3) but not at 25 (0.9±0.1) and 35°C (0.6±0.1). The results demonstrated that baroreflex function is significantly impaired at unpreferred T in *H. malabaricus*, especially at 15°C, at which untreated BG are similar to that observed after cardiac autonomic blockade.

ID: 5225

Área: *Ensino e Divulgação Científica*

Forma de Apresentação: *Ê-POSTER*

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**DEVELOPMENT OF EDUCATIONAL CARD GAME TO ASSIST LEARNING OF CRANIAL NERVES AND BRAIN LOBES LESIONS**

Neuroscience is a subject that many students have difficulty in understanding due to the complexity of the subjects. Educational games have been used to help students to comprehend subjects more dynamically, making them active members of the learning process. This study aimed to develop an

educational card game that facilitates the teaching-learning process of clinical manifestations associated with cranial pairs and brain lobes injuries. A literature search was performed to develop and raise ideas about card games. Then, we established how to apply these subjects to the deck by creating cards which were divided into Lesions Cards (composed of cranial nerve and brain lobe injuries) and Manifestation Cards (composed of clinical manifestations of these injuries). All cards were created with illustrative images obtained from books or the internet. Rules were established for the game application. As a result, we create an educational card game for three to six players in which the objective is to match the Manifestation Cards with the respective Lesion Cards. At the beginning of the game, a student must be chosen as the judge who will certify if the cards are correctly combined by checking the answer board. Also, the judge must separate the Lesion Cards from the pack and place them face up on the table. The Manifestation Cards should be shuffled and placed face down to form a pile. In clockwise order, each player must pick a Manifestation Card from the draw pile and put it correctly on the respective Lesion Card. In this way, the Manifestation Cards will be stacked on the Lesion Cards, forming columns of overlapping cards, and the game ends when all cards are correctly combined. Thus, an educational game about cranial nerves and brain lobe disorders was developed as a strategy to assist the teaching-learning process in neuroscience. Our future direction is to apply this card game to stimulate students, enforcing learning and complimenting other teaching approaches.

ID: 5226

Área: *Fisiologia Celular*

Forma de Apresentação: *Ê-POSTER*

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## **ZELDA'S ROLE IN THE PHYSIOLOGY AND DEVELOPMENT OF THE MOSQUITO *Aedes Aegypti***

How do progenitor cell populations modify their characteristics and differentiate into distinct cell types? Recently, our group identified a unique transcription factor of insects and crustaceans, specifically expressed in progenitor cell populations at distinct times throughout development of the beetle *Tribolium castaneum*. The decrease in the expression of this transcription factor *zlda* (*zld*) alters the morphology of several embryonic and post-embryonic structures of this beetle such as abdominal segments, antennae, legs and wings. *zld* is considered a pioneer transcription factor, a factor that binds directly to the closed chromatin leading to its opening, and consequently to gene activation. Considering that *zld* is essential for the development and the lack of functional studies of this transcription factor in the mosquito *Aedes aegypti*, we propose the present study. An investigation of the role of *zld* in the *A. aegypti* mosquito is the major aim. Our recently established *in situ* hybridization protocol will be performed to analyze spatial expression at specific stages of development followed by histological sections, real-time PCR experiments for analysis of the temporal expression pattern of the gene, RNAi techniques to obtain gene silencing and Cas9/CRISPR for gene knock-out. A specific antibody for *zld* will be prepared for protein expression analysis. The spatial expression pattern of genes important for development was determined, demonstrating the efficiency of the new method. *zld* is expressed during embryogenesis during cellularization and later in the nervous system. Our studies are extremely important for connecting the functional roles of *zld*. To understanding of *zld*'s role in the control of gene regulation and cell differentiation processes and the identification of molecular targets for biological control might bring us new insights into the biology of this important vector.

ID: 5228

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### **EFFECTS OF MATERNAL VITAMIN D DEFICIENCY ON HORMONAL AND METABOLIC PARAMETERS OF RAT OFFSPRING: DIFFERENCES BETWEEN MALES AND FEMALES**

Vitamin D is a vital nutrient metabolized by the body, and studies show that maternal vitamin D deficiency (VDD) causes long-term changes in the offspring. However, little is known if these effects differ between males and females. This study aimed to investigate the impact of maternal VDD on hormonal and metabolic parameters in male and female rat offspring. Sixteen 5-week-old female Wistar Hannover rats fed a standard diet (AIN93G), modified diet (AIN93G without vitamin D), or modified diet with Calcium (AIN93G without vitamin D + Calcium) for six weeks. They mated at the end of this period, and diets were maintained throughout pregnancy and lactation. At weaning, male and female offspring were separated into three groups: 21-day-old animals born and breastfed to mothers fed a standard diet (SD; n = 9) or modified diet (VDD; n = 11 and VDD+Ca; n = 16). Pups were euthanized at the end of lactation, and blood was collected to measure calcium, PTH, insulin, glucagon, and glycemia as well as liver was removed to measure glycogen.\* P<0.05 (CEUA 52/2018). Males and females of the VDD group showed a reduction in serum calcium (7.04±0.1 and 7.2±0.1 mmol/L vs 8.7±0.1 and 8.8±0.2 mmol/L in controls, respectively) and an increase in plasma PTH (2534 ±83 and 1003±373 pg/ml vs 170±29 and 829±255 pg/ml in controls, respectively) concentrations. Calcium and PTH levels were restored by the calcium-enriched diet in males and females. The male groups VDD and VDD+Ca showed a drastic reduction in plasma insulin concentration (0.84±0.1 and 0.49±0.1 ng/ml) as compared to the control group (2.3±0.6 ng/ml), an effect that was not observed in females. Both males and females did not show changes in glycemia, plasma glucagon concentration, or hepatic glycogen content. These data show a sexual-dimorphic effect of maternal VDD on young rat offspring and suggest that such deficiency impairs pancreatic development with possible impairment of beta-cells in males independent of hypocalcemia.

ID: 5231

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **RELATIONSHIP BETWEEN OBESITY AND NOCICEPTIVE CHANGE IN RATS**

Obesity is a metabolic disease responsible for damage to the body. It's understood that the accumulation of adipose tissue leads to a chronic inflammatory process due to the systemic release of inflammatory cytokines. Aiming at the association between inflammation and pain, alterations present in obesity may be linked to possible changes in the nociceptive profile. Thus, this study aimed to evaluate effects of inflammatory damage caused by obesity on the nociceptive profile. Study was approved by CEUA (039/2019). Twenty-four Wistar rats were used, with initial weight of approximately 200g, under a 12-

hour light/dark cycle, and under controlled temperature conditions, which were divided into a control diet (CD) and hypercaloric diet (HD) group. The groups were evaluated weekly for obesity by body weight and at the end of induction using the adiposity index. Nociceptive profile was analyzed by the Von Frey mechanical nociception test and the acetone test for thermal sensitivity to cold. After 60 days of obesity induction, euthanasia was performed and whole blood was collected for the evaluation of inflammatory cytokines. Statistical analysis was performed using Student's t test, considering  $p < 0.05$ . The results showed the CD group showed an increase in body weight, however, the HD group significantly increased its adiposity index. Thus, indicating that body weight may not be directly related to the concentration of adipose tissue. Furthermore, the animals in the HD group showed changes in the thermal and mechanical nociceptive profile, and there was a significant increase in the systemic release of TNF- $\alpha$  in the HD group compared to CD. Thus, we conclude that HD was effective in increasing the concentration of adipose tissue and changing the nociceptive profile. Furthermore, we can infer that TNF- $\alpha$  release may be related to the adiposity index, both verified in the HD group, generating an inflammatory process that may be impacting the nociceptive profile of HD animals.

*ID: 5232*

*Área: Ensino e Divulgação Científica*

*Forma de Apresentação: Ê-POSTER*

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## THE USE OF SOCIAL NETWORKS IN PHYSIOLOGY TEACHING

Social networks are means of interaction used worldwide and are currently used in different areas of education, including the teaching of Physiology. Social networks can be used in different ways in physiology teaching, this allows crucial points such as the interaction between teacher and student to be better explored. Considering these possibilities, the aim of this study is to evaluate how social networks have been used as a tool for teaching Physiology. This is a literature review study that used the Pubmed and ERIC databases, with the keywords "Online Social Networking", "Facebook", "Youtube", "Whatsapp", "Wechat", "Instagram", "Linkedin", "Twitter", "Reddit", "Pinterest", "Teaching", "Distance Education" and "Physiology". Articles published in English (2015-2020) that used social networks as tools for teaching physiology and that applied some measure to evaluate the results were included. 250 articles were found and five were selected. The use of three social networks was seen: Facebook, Twitter and Youtube. Facebook was used for posting content, activity notices and discussions in interaction groups (WJET. 8:258,2016; JCPSP. 27:409,2017; Adv. Physiol. Educ. 44: 358,2020). Twitter served as a place for questions and answers (Adv. Physiol. Educ. 44: 706,2020) and Youtube was used as a platform for general physiology videos (Adv. Physiol. Educ. 43:0383,2019). Four studies had good learning results, reaching effects such as aiding in learning, increased interaction between teacher and student, better updating of users and advancement in education. Only one article did not get good results with the networks, describing irrelevant results with the use of Facebook. Finally, social networks can be used in a variety of ways to teach physiology and its application is a viable way to improve the quality of the teaching of this science.

ID: 5233

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **ELECTROPHYSIOLOGICAL PROPERTIES OF PARASYMPATHETIC RESPIRATORY MOTONEURONS OF THE DORSAL MOTOR NUCLEUS OF THE VAGUS FROM ASTHMATIC MICE**

Asthma is characterized by recurrent bronchoconstriction associated with bronchial hyperresponsiveness and mucus hypersecretion. The parasympathetic preganglionic motoneurons are located in the Nucleus Ambiguus and Dorsal Motor Nucleus of the Vagus (DMV). These motoneurons innervate the lower airways, which may control the bronchoconstriction and mucus secretion. We hypothesized that the intrinsic excitability of DMV parasympathetic respiratory motoneurons from asthmatic mice is increased. We used an asthma model established in C57BL/6 male mice (7 weeks old; CEUA 087/2019) sensitized with ovalbumin (OVA) and aluminum adjuvant (IP) in three different days with seven days of intervals. One week after the last sensitization, mice were challenged with OVA intranasally for three consecutive days. Control mice received only PBS. Using whole cell patch-clamp (current clamp) in medullary coronal slices and retrograde labeling we measured the intrinsic electrophysiological properties, in the presence of blockers of fast synaptic transmission, of the DMV respiratory motoneurons from control and asthmatic mice. Data are expressed as mean  $\pm$  standard deviation. We found that DMV respiratory motoneurons from control and asthmatic mice had similar values of capacitance ( $23.51 \pm 7.68$  vs  $23.6 \pm 5.68$  pF;  $p > 0.97$ ;  $n = 31$ ). We observed a depolarization of the resting membrane potential of the DMV respiratory motoneurons from the asthmatic mice compared to the control mice ( $-47.85 \pm 7.29$  vs  $-57.63 \pm 6.69$  mV;  $p < 0.0002$ ;  $n = 31$ ). We also found an increase in the excitability ( $140$  pA:  $27.25 \pm 17.88$  vs  $13.2 \pm 12.68$  Spikes;  $p < 0.008$ ;  $n = 31$ ) and in the frequency of the spontaneous action potentials ( $1.74 \pm 1.72$  vs  $0.00 \pm 0.00$  Hz;  $p < 0.001$ ;  $n = 31$ ) in the asthmatic mice, without changing the input resistance ( $0.39 \pm 0.25$  vs  $0.29 \pm 0.11$  G $\Omega$ ;  $p > 0.99$ ;  $n = 31$ ). We conclude that the excitability of the DMV parasympathetic respiratory motoneurons is enhanced in a mice model of asthma.

ID: 5234

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### **PHYTOESTROGENS AND THE INCREASED EXPRESSION OF SLC2A4 / GLUT4 IN FAT CELLS**

Diabetes mellitus has followed an increasing number of people in the world and is related to the variation in endogenous estrogen levels (menopause). In this context, phytoestrogens become an alternative, with the intention of adjusting circulating estrogen levels. Thus, the study of the properties of these molecules is essential, as they are present in our diet. Among the classes of phytoestrogens, the ones with the greatest estrogenic capacity are the isoflavones, which include genistein and daidzein. It is known so far that estradiol (E2) has an ability to increase the expression of GLUT4 in adipose tissue

and, consequently, improves insulin sensitivity; but the effects of phytoestrogen in this area have not been explored yet. Therefore, the aim of this study is to analyze the effects of phytoestrogens on the expression of Slc2a4 / GLUT4 in adipose cells. For that, 3T3L1 adipose cells were treated with E2, genistein (G) and daidzein (D) during 24h, for evaluation of Slc2a4 gene expression (RTqPCR) and GLUT4 (Western blotting). We observed that the Slc2a4 gene expression was higher in cells treated with E2, G and D, as compared to the control cells ( $p < 0.05$ ); similarly, the GLUT4 increased in E2-, G- and D-treated cells, as compared to control cells ( $p < 0.05$ ). In conclusion, the isoflavones used in this study increase the expression of Slc2a4 / GLUT4, which may indicate that the use of these phytoestrogens can improve glucose uptake in fat cells. We need more studies in the area to propose that phytoestrogens may have beneficial effects for diabetes treatment.

ID: 5235

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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#### ESR1 SELECTIVE AGONIST IS ABLE TO STIMULATE Slc2a4 EXPRESSION IN 3T3-L1 ADIPOCYTES

Diabetes mellitus is a disease that reaches high rates of morbidity and mortality. The development of insulin resistance is directly related to the onset and progression of the disease, which in turn is related, among other processes, to the amount of glucose transporter GLUT4 (gene Slc2a4). Estrogen (E2) is a steroid hormone commonly associated with female reproductive physiology, however, its role in different systems has been reported, such as in glycemic homeostasis. E2 can perform its function through the ESR1 receptor, predominantly present in adipocytes. Therefore, the aim of this work was to evaluate the expression of Slc2a4/GLUT4 after treatment with E2 and ESR1 selective agonist (PPT) in 3T3-L1 fat cells. Fibroblast cells were differentiated into 3T3-L1 adipocytes, treated with E2 (17 $\beta$  Estradiol) and PPT. Oil Red (OR) staining was performed to analyze cell differentiation, quantification of Slc2a4 mRNA by RT-qPCR technique and GLUT4 total protein content by Western Blotting. 3T3-L1 cells achieved satisfactory cell differentiation, confirmed by OR. Treatment with E2 significantly increased the expression of Slc2a4 and GLUT4 when compared to the control group ( $P < 0.05$ ), which was reproduced by the groups treated with PPT ( $P < 0.05$ ), and E2+PPT ( $P < 0.05$ ). Thus, it was evident that E2 is able to increase the expression of Slc2a4/GLUT4 in adipocytes. The activity of E2, mediated by ESR1, to promote the transcription of Slc2a4, may have different ways of action, including: direct and indirect nuclear effects, associated or not with other transcription factors, such as NF $\kappa$ B and SP1. Concluding, the action of estrogen via the ESR1 receptor is capable of boosting the expression of Slc2a4 in 3T3-L1 adipocytes, contributing to the final content of GLUT4, which is important for local glycemic homeostasis.

ID: 5236

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **CALORIES FROM HUMAN MILK: DOES PASTEURIZATION HAVE ANY INFLUENCE?**

The Human Milk Banks (HMBs) are specialized services in the processing of human milk (HMB) for donations. Pasteurization is a high temperature process to inactivate the most resistant microorganism that can be found in HM, *Coxiella burnetti*. If correctly conducted, this process ensures the safest quality of the HM that will be provided to babies admitted to Neonatal Intensive Care Units (NICU). Although it is an essential process for all donated HM, pasteurization can change the caloric value of HM, as already researched in earlier literature. This study focused on the changes in the caloric value of Raw Human Milk (RHM) and Pasteurized Human Milk (PHM). A longitudinal research was conducted with RHM and PHM of 50 donors registered at the HMB of Araçatuba-SP. To determine the caloric value (kcal/Liter), by microcentrifugation, a sample of 3 mL of RHM and PHM was collected in a test tube. The results were analyzed using mean and standard deviation and the t student test, considering  $p < 0.05$  to assess the difference between RHM and PHM. The research was authorized by the Research Ethics Committee of the Paulista University, UNIP, number 3.420.826. There was a reduction in the calorie of PHM in relation to RHM ( $527.5 \pm 97.9$  and  $504.4 \pm 92$  Kcal/L, respectively) of about 4.3% ( $p < 0.0001$ ), as demonstrated in literature. Pasteurization promoted a reduction in the PHM calorie content, which may be related to the adherence of fat to the wall of the bottle during the filling process and to the loss during agitation of HM during pasteurization. Thus, it is concluded that pasteurization had an influence on the HM calorie.

*ID: 5238*

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER*

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### **PLASMA RENIN ACTIVITY AND ALDOSTERONE CONCENTRATIONS IN DOGS WITH CHRONIC KIDNEY DISEASE**

In chronic kidney disease (CKD), the renin-angiotensin-aldosterone system (RAAS) is activated as a compensatory mechanism to maintain glomerular filtration rate. However, its activation may influence the development of systemic arterial hypertension and proteinuria, that are related to worse clinical conditions. The RAAS activity can be evaluated by determining the plasma renin activity (PRA) and aldosterone concentration (p[aldo]). Therefore, the aim of this study was to evaluate the PRA and p[aldo] in healthy dogs and dogs with naturally occurring CKD. A total of 25 dogs were recruited for this study: 14 with CKD (CKD group) and 11 healthy (control group). Diagnosis of CKD was based on history, physical examination findings (including measuring systolic blood pressure (SBP) by Doppler technique) and routine laboratory abnormalities. PRA and p[aldo] were determined by radioimmunoassay. Dogs had a normal state of hydration at the time of analysis. Comparison between groups was made using Student's t test or Mann-Whitney test ( $p < 0.05$ ). The protocol was approved by the Animal Use Ethics Committee (number 6253300517). The dogs of CKD group presented anemia, azotemia, hypocalcemia, hyperphosphatemia, ionized hypocalcemia, and low urinary density. Urine protein- to- creatinine ratio was higher in CKD group compared to control ( $2.69 \pm 5.22$  vs

0.12±0.03; p=0.0014). CKD and control groups did not differ in relation to the mean value of SBP (134±13.06 vs 142±23.41 mmHg; p=0.458), PRA (1.47±0.5 vs 1.16±0.7 ng/mL/h; p=0.226), and p[aldo] (25±16.97 vs 32±15.13 ng/mL; p=0.334). The results showed that dogs with CKD, normotensive and hydrated, did not show changes in PRA and p[aldo], despite the proteinuria and severity of the kidney disease.

ID: 5239

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de São Paulo (UNIFESP)

### **PROBIOTICS *LACTOBACILLUS RHAMNOSUS* AND *LACTOBACILLUS REUTERI* REDUCE INFLAMMATION AND DYSLIPIDEMIA INDUCED BY CHRONIC STRESS IN WISTAR RATS**

Chronic stress induces inflammation and dyslipidemia, predisposing to cardiovascular disease. On the other hand, the immunomodulatory and anti-inflammatory properties of probiotics can beneficially affect the host health. We investigated the effects of *Lactobacillus rhamnosus* and *Lactobacillus reuteri* on dyslipidemia and inflammation induced by chronic unpredictable moderate stress (CUMS) in rats. Male Wistar rats (4 weeks old; body weight 80-130g) were randomly assigned into: Control (C), Stress (S), Control+Probiotic (CP) and Stress+Probiotic (SP) (n=11-12/group). Probiotics (*L. rhamnosus* and *L. reuteri*, 1 billion colony-forming units/probiotics, Terapêutica Farmácia de Manipulação, SP, Brazil) were administered for 8 weeks, and during weeks 3, 4, and 5 CUMS was applied (Ethic's protocol# 9678230719). 15 days after CUMS, blood and liver were collected. The concentration of lipids was determined using commercial kits and TNF- $\alpha$ , IL-1 $\beta$ , and IL-10 were determined using a multiplex array reader (Bio-Plex Human Cytokine Assay; California, USA). Stress increased serum cholesterol and probiotics reduced it to C levels (S=125±17 vs. C=111±9 and SP=110.7±8 mg/dl). Stress increased hepatic lipids (S=4.1±0.4 vs. C=3.18±0.7mg) with no influence of probiotics (CP=3.5±0.7; SP=3.6±0.4mg). Triglycerides were not affected by CUMS or probiotics. CUMS increased TNF- $\alpha$  (S=388±85 vs. C=28.74±25 pg/mg; SP=172.5±80 vs. CP=20.83±20 pg/mg) and probiotics did not influence it. IL-1 $\beta$  was increased after CUMS and probiotics reduced it (S=343±63.8 vs. C=25±5 and SP=155.2±43 pg/mg). CUMS reduced IL-10 and probiotics increased it (S=65±28.6 vs. C=115±42.6, CP=203.3±14 and SP=196.5±11 pg/mg). Our data show the beneficial influence of probiotics on dyslipidemia induced by chronic stress, by reducing cholesterol levels. Moreover, probiotics exerts immunological benefits in the context of stress, by modulating pro/anti-inflammatory cytokines, decreasing IL-1 $\beta$  and increasing IL-10 circulating levels.

ID: 5242

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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## PHYSIOART - USING ART AS A PEDAGOGICAL TOOL IN A PH. D NEUROSCIENCE OF PAIN COURSE

Recently we showed by our PhysioArt project, that art is an efficient supporting pedagogical tool to learn and teach physiology (Flôr et al., *adv physiol educ*, 2020). Under this corona virus pandemic, we offer to PhD students from Federal University of Sergipe (UFS) an online PhysioArt course to explore the neuroscience of pain. Our major aim was to motivate our Ph.D students to enjoy and discuss alternative pedagogical tools. Students from PhD Program in Physiological Sciences from UFS (n=36) participated of our online physioart project, previously approved by the institutional Education Committee (31661720.7.0000.5188), about neuroscience pain using the virtual platform Zoom. Our neuroscience of pain classes, were enriched exploring different artworks interpretations. After, students were instructed to recreate an artwork applying the physiological concepts learned and discussed in our online meetings. On a pre-established date, each group exhibited their reinterpretation work in a virtual exhibition meet. During the online meet, students exhibited their reinterpretations, explaining why they chose the specific artwork and which physiology concepts of the neuroscience pain were explored in their art reinterpretations. According to the participants, 61.1% said they enjoyed studying neuroscience of pain through the PhysioArt project. In addition, 52.8% agreed that PhysioArt made the learning process more attractive and 41.7% said that there was a great interest to study the neuroscience of pain. Interesting that 77.8% declared that online physioart activity helped them to reduce the harmful effects of social isolation. Thus, as many of the participant suggested, integrative physiology online classes and PhysioArt activity, was stimulating them more enjoyably and creatively to study and learn physiology, has also helped them to avoid the boredom of virtual classes, as well as loneliness, anxiety, and depression symptoms aggravated by COVID-19 isolation.

*ID: 5243*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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## TEMPORARY COURSE OF A CD11c+ MICRÓGLIA POPULATION IN THE DEVELOPMENT OF AQP4-/- MICE

Aquaporin 4 (AQP4) is the most abundant water channel within the central nervous system (CNS). It is expressed in ependymal cells and glia limitans, including pericapillary astrocyte foot processes, where this protein plays a significant role in cerebrospinal fluid (CSF) homeostasis. Stenosis of Silvio's aqueduct occurs in 10% of the offspring of AQP4 knock-out (AQP4-/-) mouse, causing the death of the animal due to the development of an obstructive congenital hydrocephalus. Transcriptomic analysis of the periaqueductal tissue from day P11 mice revealed that genes corresponding to a postnatal microglial subpopulation positive for CD11c marker were overexpressed in AQP4-/- animals that did not develop hydrocephalus, suggesting a possible protective effect of such microglial subset. In the present work, we evaluated by immunofluorescence assays against CD11c and IBA1 the localization of this population in the brain of the AQP4-/- mouse and quantitatively compared the abundance of CD11c+ microglia respect to that detected in wild-type (WT) animals. This analysis was performed in mice of 3, 5, 7, 11 and 20 days of age, aiming to describe the time course followed by this microglia subtype. The results obtained showed expression of CD11c+ microglial cells in the corpus callosum, cerebellum and aqueduct; being their presence more wide-ranging in the AQP4-/- animal, where they appear at day P3 and reach a

maximum at day P11, while in the WT animal CD11c+ microglia are undetectable until day P5 and reach their peak at day P7. The greatest difference between WT and AQP4-/- animals is established in the aqueduct at day P11, where CD11c+microglia are present at exacerbated levels in the transgenic animal, which correlates with possible protection against aqueduct stenosis and hydrocephalus in these mice. Further experiments will be necessary to understand how this CD11c+ microglia orchestrate its action favoring a normal development of the aqueduct.

ID: 5244

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### NEONATAL EXPOSURE TO HIGH OXYGEN LEVELS IMPACTS MITOCHONDRIAL BIOGENESIS, DYNAMICS, AND OXPHOS COMPLEXES IN DIAPHRAGM OF JUVENILE RATS

Individuals born preterm (PT) present reduced aerobic capacity, lower muscle performance and inspiratory muscle strength. Mechanisms leading to skeletal muscle impairment in PT are poorly understood. Neonatal rats exposed to high O<sub>2</sub> (O<sub>2</sub>-related injury – OI), a recognized model of prematurity-related conditions, develop skeletal muscle atrophy, fibrosis, fiber typing switch and reduced contractility. Mitochondria (mito) are key players in muscle physiology, however, whether mito is impaired in the skeletal muscle changes following PT is unknown. We aimed to determine whether mito parameters are impacted by OI in juvenile rats. Sprague-Dawley male pups exposed to 80% O<sub>2</sub> (OI) or room air (Ctrl) from days 3-10 of life were sacrificed at 28 days of age and diaphragm was collected. Results are mean ± SD; OI vs. Ctrl are compared using t-test (n=5-7/group; p<0.05). Ethics approval 3218. OI rats show reduced gene expression (RT-PCR) of mito biogenesis marker PGC-1α (0.29±0.07 vs. 1.00±0.67), and no differences in citrate synthase. For mito dynamics, OI rats showed increased gene expression of mito fusion marker Mfn1 (3.62±1.86 vs. 1.00±0.83), but no differences for mito fission markers Fis1 and Drp1. In OI, protein expression (Western Blot) of oxidative phosphorylation (OXPHOS) complexes II (0.64±0.22 vs. 1.00±0.22) and III (0.64±0.24 vs. 1.00±0.27) was significantly decreased while complex V (p=0.09) tended to be lower. No differences were observed for the complexes I and IV. Gene expression of mito biogenesis marker Nfr2 (p=0.07) and glycolytic enzyme hexokinase II (p=0.06) tend to be decreased in OI. Neonatal high O<sub>2</sub> exposure decreased mito biogenesis and OXPHOS complexes, as well as increased mito fusion in juvenile rats, which may impact mito oxidative capacity and function. Further experiments on mito respiration and myofiber contractile properties will contribute to determine the mechanistic role of mito dysfunction on skeletal muscle impairment following PT birth.

ID: 5247

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **CORRELATION OF SARS-COV-2 VIRAL LOAD WITH SEX, AGE AND SYMPTOMS IN PATIENTS AFFECTED BY COVID-19 IN VITÓRIA DA CONQUISTA**

COVID-19, a respiratory disease caused by the SARS-CoV-2 virus, was declared a pandemic by the World Health Organization. 80% of patients with COVID-19 have mild symptoms, 15% progress to hospitalization requiring oxygen therapy and 5% need it of intensive care unit. RT-PCR based methods are references for detecting SARS-CoV-2, and viral RNA is measured by Cycle Threshold (Ct), in which lower values represent higher viral loads. The objective is to correlate the viral load of patients infected with SARS-CoV-2 with age, gender, considering the symptoms of patients and the outcome of the infection. This is an observational, quantitative study with a descriptive retrospective cut approach through data collection, using the Covid-19 information system of the Vitória da Conquista city hall and crossed with data from the SARS-CoV-2 detection systems. Data from 781 positive patients for SARS-CoV-2 of both genders living in the city of Vitória da Conquista/BA, tested using RT-PCR, were used. 37.5% of the patients were male, with a mean age of 49 years  $\pm$  20.187 and Ct 26.47  $\pm$  6.563. 62.74% were female with a mean age of 44 years  $\pm$  19.71 and Ct 26.97  $\pm$  7.304. Among the asymptomatic group the Ct was 28.44  $\pm$  7.295, in the mild group 27.44  $\pm$  6.588, in the moderate group 26.48  $\pm$  6.588, in the severe group 30.318  $\pm$  6.978 and in the death group 23.012  $\pm$  7.649. We found that the viral load was higher among men, and they had a higher risk of having more severe symptoms and being hospitalized when compared to women. A lower viral load was observed in the asymptomatic group and a higher load in the group whose outcome was death. So, there was a relationship between viral load and disease severity and case outcome.

*ID: 5248*

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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### **SLOWLY INCREASING POSITIVE END EXPIRATORY PRESSURE REDUCES LUNG DAMAGE AND IMPROVES CARDIAC FUNCTION IN AN EXPERIMENTAL MODEL OF MILD/MODERATE ACUTE RESPIRATORY DISTRESS SYNDROME IN WISTAR RATS**

Increasing positive end-expiratory pressure (PEEP) or recruitment maneuvers are thought to augment stress in lung parenchyma, extracellular matrix, and lung vessels; however, adaptive responses may occur. We evaluated the effects of PEEP on lung damage and cardiac function when increased abruptly, gradually, or more gradually in experimental acute respiratory distress syndrome (ARDS). Experimental ARDS was induced by *Escherichia coli* lipopolysaccharide intratracheally (CEUA 034/18). After 24h, male Wistar rats (n=48) were randomly assigned to four mechanical ventilation strategies: (1) PEEP=3 cmH<sub>2</sub>O for 2h (control); (2) PEEP=3 cmH<sub>2</sub>O for 1h followed by an abrupt increase to 9

cmH<sub>2</sub>O until the end of the second hour (no adaptation time); (3) PEEP=3 cmH<sub>2</sub>O for 30 min followed by a gradual increase 9 cmH<sub>2</sub>O for 30 min, then kept constant until the end of hour 2 (shorter adaptation time); and (4) more gradual increase in PEEP from 3 cmH<sub>2</sub>O to 9 cmH<sub>2</sub>O during 1h and kept constant thereafter (longer adaptation time). At the end of the experiment, oxygenation was better with shorter and longer adaptation times than in the control group and with no adaptation; diffuse alveolar damage and interleukin-6 expression were higher with no adaptation time (median [interquartile range], 26.7 [13.2–31.9]) than in controls (1.5 [0.7–4.4]), and with shorter (3.8 [0.9–7.5]) and longer (5.7 [3.2–7.7]) adaptation times. Club cell protein-16, vascular cell adhesion molecule-1, amphiregulin, decorin, and syndecan were also higher with no adaptation time than in the other groups. Pulmonary arterial pressure was lower with longer adaptation time compared with shorter and no adaptation time, as indicated by the pulmonary acceleration time/pulmonary ejection time ratio. Gradual increase in PEEP may distribute lung stress more homogeneously in the alveolar and microvascular compartments, resulting in less lung damage; a more gradual increase in PEEP also reduced pulmonary arterial pressure.

ID: 5250

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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### **PRE-TREATMENT WITH WHITE EGG HYDROLYSATE TO PROTECT THE REPRODUCTIVE SYSTEM AGAINST DAMAGE CAUSED BY CADMIUM EXPOSURE IN RATS**

Natural compounds derived from animal protein such as egg white hydrolysate have peptides that can prevent the toxic effects of metals. We investigated the effects of pre-treatment with egg white hydrolysate in rats exposed to cadmium chloride (CdCl<sub>2</sub>). Wistar male rats ( $\pm$  300 g) were treated for 28 days: a) Untreated - Ct (H<sub>2</sub>O by gavage + H<sub>2</sub>O i.p.); b) CdCl<sub>2</sub> (H<sub>2</sub>O by gavage + CdCl<sub>2</sub> 1mg/kg – i.p. in the last 14 days); c) EWH (EWH 1g/Kg/day by gavage + H<sub>2</sub>O i.p. in the last 14 days); d) EWH+CdCl<sub>2</sub> (CEUA - Nº 012/2019). We analyzed sperm motility, daily sperm production, number and transit time in the epididymis, sperm membrane integrity, oxidative state in the testes and epididymis by biochemical assay, and the expression of caspase 3 in the testes by immunofluorescence. The data are expressed as median and analyzed by the test of Kruskal-Wallis or as mean  $\pm$  SEM and analyzed by ANOVA - 1 way followed by Bonferroni test ( $p < 0.05$ ). Pre-treatment with EWH prevented: a) The reduction in the number (Ct: 226.2  $\pm$  24.7; CdCl<sub>2</sub>: 25.5  $\pm$  10.7\*; EWH: 202.1  $\pm$  20.6; EWH+CdCl<sub>2</sub>: 192.5  $\pm$  22.6# x10<sup>6</sup>) and daily sperm production; b) The reduction of sperm transit time (Ct: 5.9  $\pm$  0.3; CdCl<sub>2</sub>: 10.6  $\pm$  1.1\*; EWH: 7.2  $\pm$  0.1; EWH+CdCl<sub>2</sub>: 6.6  $\pm$  0.5# day); c) Decreased sperm motility; c) Damage to sperm morphology reducing head abnormalities; d) Damage to membrane integrity; e) The increase in oxidative stress and lipid peroxidation; e) The reduction in the total antioxidant capacity in the epididymis and the activity of SOD and Catalase in the testis; f) Increased detection of Caspase 3 in the testes. Pre-treatment with EWH was able to prevent damage caused by Cd in the reproductive system of rats.

ID: 5253

Área: *Ensino e Divulgação Científica*

Forma de Apresentação: *Ê-POSTER*

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### **INSPIRING WOMEN TO BE SCIENCE PROTAGONISTS BY SHARING THE HISTORY OF FEMALE PERSONALITIES BY AN INSTAGRAM WEB SERIES**

Women are still underrepresented in several areas, including science. It is important to disseminate female contributions to different areas to encourage and attract people's attention, especially young women. This work aims to present the project "Women who Inspire", developed by the Physiology Research Group (GPFis)/Federal University of Pampa. The project consists of the production and publication of biweekly episodes of a web series on Instagram. Each episode addresses the trajectory of a different female personality. After bibliographical research and construction of a script, we used Canva and Clipchamp to create the episodes. The video script addressed the trajectory and contributions of the woman chosen to present. We posted the videos on the GPFis Instagram profile (@gpfisunipampa). To evaluate the material, we access the statistics that Instagram provides free of charge. The data allow obtaining information about the audience that interacts with the account, the network's activity, and the number of likes, comments, and shares on the publication. So far, five episodes are available, covering the trajectory of Maria da Penha, Hypatia of Alexandria, Greta Thunberg, Marie Curie, and the Witches of the Night (aviators from the Former Soviet Union). The first episode had 1,322 views, 147 shares, 84 likes, and 6 comments; in addition, 543 accounts were reached out, 26% not following the account. When we compare the statistics of the first video with the last one, we observe that the number of accounts reached out increased, rising to 3,521, of which 85% were not following the profile; there were 161 shares, 70 likes, and 13 comments. These data highlight the reach of the project's objectives, which aim to disseminate these female figures and promote their popularization, thus expanding the population's knowledge about the trajectory of women who have contributed to scientific and social achievements.

*ID: 5254*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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### **LEARNING TESTS TAKEN WITH STUDENTS IN RELATION TO CORTISOL LEVELS: A REVIEW**

Assessments are one of the main reasons for stress in students during learning processes, and this is related to the fear of failure or frustration of goals, which ends up generating academic stress. Stressful situations lead to an alteration in body homeostasis, which can increase cortisol levels (Adv. Physiol. Educ. 44:744, 2020). Thus, stress and cortisol release is associated with positive and negative effects on learning and memory, since glucocorticoids bound to brain receptors are related to memory formation (Brain Sci.10:544,2020). Based on this, the objective of this study was to identify teaching-learning situations that alter cortisol levels and modulate learning in students. For the present literature review, the PubMed and Eric platforms were used to search for the term "cortisol and learning". The inclusion criteria adopted were: articles published between the years 2016 to 2020, conducted with humans, by means of biomarkers, and that had conducted an assessment of the subjects' learning. Eleven articles were found, and of these, four met the study criteria. The studies of Kirsch et al., 2017; Cardozo, 2020,

showed that cortisol levels in relation to anxiety and stress in students using active methodologies or studying in alternative environments were lower when compared to students using traditional methodologies. Already the studies Becker et al., 2020; Smeets.T, 2018, perform stress induction through protocols to increase subjects' temperature before or after a learning activity and showed that learning was lower because of the elevated cortisol levels during inductions. Thus, we conclude that the learning was favored in relation to the alternative methodologies compared to the traditional ones, as well as stressful situations increase cortisol levels and impair learning.

*ID: 5255*

*Área: Ensino e Divulgação Científica*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Federal do Pampa (UNIPAMPA)*

### **EDUCATIONAL GAMES IN HIGHER EDUCATION, IS IT A GOOD IDEA?**

Educational games have been a valuable resource in the search for new ways of learning. Within the active methodologies, this technique is very beneficial in the teaching-learning process (Adv. in Phys. Ed.39:27,2015). Health undergraduate courses have dense disciplines such as physiology, and therefore other methods to compose the teaching-learning repertoire, such as games are needed (Adv. in Phys. Ed. 40: 223, 2016; Adv. in Phys. Ed. 41:222,2017). In this sense, the present study analyzed, through the literature review method, the impact of the use of educational games in the basic disciplines of undergraduate health courses. The academic search platforms PubMed and Eric were used, focusing on the theme of educational games in health. The inclusion criteria were: articles published between 2015 and 2020 with the keywords "Educational game" and "digital game" in English and from undergraduate courses in the health area. The articles should also contain satisfaction questionnaires. Seven articles met the criteria. According to the research findings, the use of games provides a more interactive and assertive environment, because students who played had better results. The Kahoot application, considered an easily accessible tool, increased the participation and competitiveness among students (PLoS ONE. 14: 7, 2019). The other authors show us that the use of low-cost materials can generate a good intervention in the performance of activities, showing the positive character of this strategy. The students reported that with the use of games the understanding of the content was better than the lecture class. Therefore, based on the above information, we conclude that educational games in higher education are tools that have an impact on the formation of students (Adv. in Phys. Ed. 41:222,2017; Adv. in Phys. Ed.39:27,2015) Still, (Adv. in Phys. Ed. 44:153, 2020; Adv. in Phys. Ed. 44: 50,2020; Adv. in Phys. Ed. 42, 79: 2018.)

*ID: 5256*

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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## SHORT-TERM SUSTAINED HYPOXIA DEPOLARIZES THE MEMBRANE POTENTIAL OF CAROTID BODY GLOMUS CELLS FROM WISTAR RATS

The carotid bodies (CBs) are the main arterial chemoreceptor and its activation by hypoxia recruits cardiorespiratory reflexes (hyperventilation and sympathetic activation). Besides, chronic activation of the CBs during exposure to sustained hypoxia (SH) is necessary for the generation of ventilatory acclimation to hypoxia. In the present study, we hypothesized that short-term SH increases the excitability of the carotid body glomus cells from Wistar rats. The effects of short-term SH (FiO<sub>2</sub> = 0.1) for 24 hours on the electrophysiological properties of the carotid body glomus cells from male Wistar rats (3-4 weeks old) were evaluated. The carotid bodies glomus cells were isolated and plated on glass coverslips. The electrophysiological properties were recorded (2-8 hours later) using whole cell patch clamp, in the voltage-clamp configuration for membrane conductance analysis, and in the current-clamp configuration for membrane potential and input resistance analyses (CEUA 195/2019). We verified that short-term SH did not affect capacitance ( $2.55 \pm 1.15$  vs  $2.51 \pm 1.03$  pF;  $p=0.94$ ;  $n=24$  and  $n=26$ , respectively), membrane conductance ( $0.81 \pm 0.54$  vs  $0.70 \pm 0.51$  nS;  $p=0.50$ ;  $n=24$  and  $n=26$ , respectively), holding current ( $-50$  mV;  $-27.66 \pm 25.25$  vs  $-16.54 \pm 15.85$  pA;  $p=0.06$ ;  $n=24$  and  $n=26$ , respectively) or input resistance ( $2.18 \pm 2.05$  vs  $2.44 \pm 2.29$  G $\Omega$ ;  $p=0.78$ ;  $n=23$  and  $n=24$ , respectively) of carotid bodies glomus cells from Wistar rats. On the other hand, their membrane potential ( $-27.93 \pm 16.74$  vs  $-39.59 \pm 17.75$  mV;  $p=0.02$ ;  $n=23$  and  $n=24$ , respectively) significantly depolarized after short-term SH. We conclude that short-term SH depolarizes the membrane potential of the carotid body glomus cells from Wistar rats.

ID: 5257

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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## HIGH-FAT DIET INTAKE DURING ADOLESCENCE INDUCES CARDIOMETABOLIC SYNDROME IN ADULTHOOD IN MALE WISTAR RATS

Exposure to high fat diet during gestation and lactation programs cardiometabolic syndrome in adulthood. Adolescence also has been considered a susceptible window of development; however, little is known about the high fat exposure during this life period. The present study aims to evaluate whether high fat diet exposure during adolescence induces cardiometabolic syndrome in adulthood. Thirty-day old Wistar rats approved by ethics committee (CEUAN<sup>o</sup>1527130815) were exposed to a high fat (HF, 35% lard w/w  $n=16$ ) diet until 60 days of age then fed a normal fat diet (NF, 4.5% w/w of fat  $n=16$ ) for a further sixty days. Control animals received the NF diet throughout life. Body weight and food consumption were evaluated throughout the protocol. At 120 days of age biometric, metabolic (oGTT and ipITT) histological analysis and cardiovascular parameters were evaluated. Statistical comparisons were performed by Student's T test. The HF animals showed lower food intake ( $p<0.001$ ) and higher caloric intake ( $p<0.003$ ) during exposure to HF compared with control group. At 120 days of life, HF animals showed an increase in weight (+14%;  $p<0.002$ ), in fat pads (mesenteric: +22%;  $p<0.03$  and retroperitoneal: +34%;  $p<0.001$ ), hypertriglyceridemia (+34%,  $p<0.01$ ), hyperglycemia (+14%,  $p<0.04$ ), reduced insulin sensitivity (-30%,  $p<0.04$ ) and glucose intolerance compared to control animals. Systolic, diastolic and mean blood pressure were increased in HF animals (+10%, +4% and +17%, respectively;  $p<0.009$ ,  $p<0.004$  and  $p<0.01$ ), but heart rate remained unchanged. In histological analysis in heart showed increased perivascular

and interstitial fibrosis (+42%; +62% respectively;  $p < 0.02$  and  $p < 0.001$ ) and left ventricular hypertrophy (+29%;  $p < 0.001$ ). Exposure to HF diet during adolescence programs cardiometabolic syndrome in adulthood, characterized by cardiometabolic changes and cardiac structural changes. Highlighting the importance of maintaining sound dietary intake during the adolescent developmental window.

*ID: 5258*

*Área: Fisiologia do Exercício*

*Forma de Apresentação: Ê-POSTER*

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### **7,12 DIMETHYLBENZ[A]ANTHRACENE (DMBA) INDUCTION PROTOCOL FOR PROSTATE CANCER DEVELOPMENT**

Prostate cancer (PCa) is the 6th cancer type that most affects men in the world, and 2nd in Brazil, however, the cancer etiology is not well established. In the same perspective, we applied the 7,12 Dimethylbenz[a]anthracene (DMBA) carcinogen, to induce PCa, on the 80 Sprague-Dawley rats, 21 days,  $\pm 120g$ , the animals received the DMBA injection (65mg/kg/rat), diluted in sesame oil, with 50 days of age for 91 days. This study was approved by CEUA about protocol number 02/2020. In the ultrasound analysis, we could observe that all animals developed mass around the ventral prostate, beyond that, as a consequence of DMBA induction, the rats advanced numerous cysts and nodes around the ventral prostate. A fluid appears around the organs, in some cases, the prostatic atrophy was evident in rats, and another one, the prostates elongation indicating HPB, and itself, prostate cancer as expected. In addition, we had a rat instance where DMBA caused palsy and after then, in half of experiment the rat died, after death, we weighted, collected after that, fixed in 37% formaldehyde the ventral prostate, dorsolateral prostate, liver, heart, kidney, adipose tissues, bladder, pancreas, and seminal vesicle, to verify the cytotoxicity and it was possible to observe that these organs were modified, enlarged, with its anatomy and with its impaired functionality. All this data will be exhibit in the rat's figures, in the ultrasound analysis, and in the photo documentation that we made during the DMBA-protocol. Finally, the authors conclude that DMBA protocol was able and efficient for develop prostate cancer and cause damages to this organ and others around them.

*ID: 5259*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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## CONTRIBUTION OF HYPERTENSION AND PARASYMPATHETIC FUNCTION ON NONLINEAR ARTERIAL PRESSURE DYNAMICS IN RATS

Nonlinear approaches can extract additional information from time series that is not detectable by traditional methods. Entropy is a measure of irregularity or unpredictability of time series. On the other hand, the detrended fluctuation analysis (DFA) quantifies the degree of self-similarity of signals. This study investigated the contribution of hypertension and parasympathetic function on nonlinear arterial pressure dynamics in male rats (20 weeks old, 320-550g). Entropy and DFA were analyzed in Wistar–Kyoto (WKY=12) and spontaneously hypertensive rats (SHR=9) treated or not with donepezil (SHR+DON=8), an anticholinesterase agent that raises parasympathetic activity. All procedures were approved by the Committee of Ethics in Animal Research of the School of Medicine of Ribeirão Preto, USP, Brazil (no. 126/2011). Time series of systolic arterial pressure were evaluated by sample, fuzzy and dispersion entropy; and DFA scaled exponents in short ( $\alpha_1$ ;  $5 \leq n \leq 15$ ), medium ( $\alpha_2$ ;  $20 \leq n \leq 100$ ) and long ( $\alpha_3$ ;  $100 \leq n \leq 500$ ) window sizes. The analysis demonstrated: 1) lower sample, fuzzy and dispersion entropy in SHR (sample:  $0.73 \pm 0.05$ ; fuzzy:  $0.55 \pm 0.04$  and disp:  $3.01 \pm 0.07$ ;  $P < 0.05$ ) and SHR+DON (sample:  $0.76 \pm 0.07$ , fuzzy:  $0.57 \pm 0.06$  and disp:  $3.06 \pm 0.10$ ;  $P < 0.05$ ) vs WKY (sample:  $1.07 \pm 0.07$ , fuzzy:  $0.86 \pm 0.07$  and disp:  $3.43 \pm 0.11$ ); 2) increased  $\alpha_2$  in SHR ( $0.95 \pm 0.03$ ,  $p < 0.01$ ) and SHR+DON ( $1.02 \pm 0.04$ ,  $p < 0.001$ ) vs WKY ( $0.79 \pm 0.04$ ) and increased  $\alpha_3$  in SHR vs WKY ( $0.99 \pm 0.06$  vs  $0.76 \pm 0.06$ ,  $p < 0.05$ ), while  $\alpha_1$  was not affected ( $p = 0.97$ ). In conclusion, the results showed reduced unpredictability of systolic arterial pressure and increased medium fractal scaling in SHR treated or not with donepezil, indicating that hypertension affects the system complexity and that the parasympathetic function stimulation, induced by donepezil, produce no effects in these changes.

ID: 5260

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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## SHORT-TERM METFORMIN TREATMENT DURING EARLY ADULTHOOD IS NOT ABLE TO ATTENUATE THE DEVELOPMENT OF OBESITY LATER IN LIFE

Animals reared in small litters develop obesity and metabolic dysfunction. Previous work from our group shows that Metformin (M) treatment during the critical period of lactation, protects against the development of obesity and metabolic dysfunction later in life, so this work hypothesizes that short-term M treatment in adulthood is not able to inhibit obesity and metabolic dysfunction programmed by the litter reduction model. (SL) during lactation. Our work was approved in Animal Ethics Committee N°3220080620. The number of litters was: NL-S=4; NL-M=3, SL-S=3; SL-M=4. After delivery, at postnatal day (PN) 3, dams were divided in Normal Litter (NL), 9 pups per dam, and Small Litter (SL), 3 pups. Only male rats were used. At PN70, the animals were subdivided into two groups: Saline (S) and M both groups received daily intraperitoneal injections of 0.9% S or M 100mg/kg of body weight/day for 12 days. At PN 142 animals were euthanatized for tissue collection. All animals had free access to food and water during the whole period. Puppies in the SL group show increased body weight compared to NL (NL  $41.82 \pm 0.6305$ , SL  $60 \pm 0.4472$ ,  $p < 0.001$ ) at 21 days. Final body weight, at PN142, approximately after 2 months of the treatment, we observed that SL-S animals were significantly heavier than NL-S animals

(NL-S 427.625±7.149, SL-S 496.778±22.104 p<0.01). Retroperitoneal fat was increased in SL-S when compared to NL-S (NL-S 1.528±0.075 SL-S 2.080±0.177, p<0.01). No difference was observed in final body weight or retroperitoneal fat between SL-S and SL-M. After 2 months of a short-term treatment during adulthood, Metformin did not attenuate metabolic dysfunction induced by neonatal overfeeding.

ID: 5262

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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### STANDARDIZATION OF THE CO-CULTURE PROTOCOL BETWEEN PLATELET AND LINEAGE OF HUMAN KERATINOCYTES CELLS (HaCaT)

The Platelet Rich Plasma (PRP) has been proposed to be a therapeutical tool in regenerative medicine. The effects are attributed to platelets however, the plasma contains several other components hypothetically able to regenerate the skin. The development of a protocol to isolate platelets is crucial to elucidate the role of platelets in the control of some cell's regenerative functions. Evaluate cell viability, cell morphology, membrane integrity and VEGF-A expression in HaCaT cells when submitted to co-culture with isolated platelet. This study was approved (CEP/UFRJ-Macaé 1.922.306). Plasma was isolated by centrifugation of the blood at 581xg for 5 min. Platelets were isolated from the plasma by centrifugation at 908xg for 10 min. The platelet pellet (PI-PRP) was suspended in DMEM medium. HaCaT were grown in 6 well plates at 90% confluency and then cultured with DMEM without FBS for 12h. After this, the medium was replaced in 3 wells by DMEM without FBS (Control - CTRL) and 3 wells by DMEM without FBS+PI-PRP. After that, cellular viability by MTT, membrane integrity by trypan blue, cell and cytoskeletal cell morphology by DAPI and phalloidin staining and RNA extraction, for subsequently, qRT-PCR VEGF-A, were performed. The MTT test showed higher cell viability in PI-PRP compared to CTRL (1.18 ± 0.09; 1.00 ± 0.00, n = 12, p <0.05). The trypan blue test showed no difference between CTRL and PI-PRP (531.700 cells/ml; 540.000 cells/ml; respectively, n = 9, p > 0.05). Fluorescence microscopy analysis showed no changes in cellular morphology of the nucleus and cytoskeleton between groups. In the qRT-PCR the VEGF-A expression was higher in PI-PRP compared to CTRL (4.60 ± 1.85; 1.00 ± 0.00, n = 9, p > 0.05). The centrifugation showed to be effective for platelet enrichment. HaCaT / PI-PRP experimental co-culture model was established. This protocol demonstrated efficiently to study interaction between platelet and cell lineage.

ID: 5263

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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## THE EFFECTS OF INFUSION OF FLUIDS WITH DIFFERENT TONICITIES ON INFLAMMATION AND ENDOTHELIAL INJURY IN THE BRAIN, LUNG, AND KIDNEY IN FOCAL ISCHEMIC STROKE MODEL

Acute ischemic stroke (AIS) is a major cause of morbidity and mortality worldwide. Different approaches are performed within 3 hours after the ischemic event, including fluid infusion. However, there is no consensus on the use of fluids with different tonicities after AIS. The pre-clinical study verified whether hypotonic fluids compared to hyper or normotonic fluids may reduce brain, lung and kidney inflammation and endothelial damage in experimental focal AIS (CEUA 013/21). For this purpose, 28 male Wistar rats ( $375 \pm 23$  g) were submitted to stroke by thermocoagulation of the pial vessels in the right primary sensorimotor cortex. After 3h, the animals were anesthetized and randomly assigned into 4 groups: hypertonic (HYPER: 1.5% saline Na = 256 mEq/L), normotonic (NORMO: 0.9% saline Na = 154 mEq/L), hypotonic (HYPO: 0.45% saline Na = 77 mEq/L) and only glucose (GLUCO: 5% Na = 0 mEq/L) for two hours. During fluid infusion, animals were mechanically ventilated with tidal volume of 6 ml/kg, Positive End Expiratory Pressure (PEEP) of 3 cmH<sub>2</sub>O. Arterial blood gases and pulmonary function were measured throughout the experiment. At the end of the experiment, the lungs, brain tissue and kidneys were removed for posterior histological and molecular biology analysis. All animals survived during experiments. The preliminary data showed that the average volume of fluids was  $2.7 \pm 0.1$  ml among groups. Mean arterial pressure increased overtime in all groups ( $p=0.03$ ) but remained within 70 and 110 mmHg. No changes in blood gas analyses and lung mechanics were observed. Overall, sodium levels reduced overtime ( $p=0.03$ ) in all groups. Chloride levels were lower in HYPO and GLUCO compared to NORMO and HYPER groups ( $p<0.0001$ ). In this preliminary report, although we did not observe changes in lung function and hemodynamics, the electrolytes levels were modified. Further data is necessary to observe brain, lung and kidney inflammation and endothelial damage in experimental focal AIS.

ID: 5264

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## TECHNIQUES FOR MEASURING EMOTIONS IN STUDENTS: A LITERATURE REVIEW

Emotions are episodic and complex neurological processes generated from subjective affective experiences that trigger psychophysiological changes and express the reactions of human beings to everyday life situations (Psico.UFS. 20:153,2015). The emotional state influences learning because emotions can regulate students' academic performance. In that regard, this work aims to identify the techniques for measuring emotions in the teaching-learning process (Psicopedag. 33:365,2016). So, a literature review was carried out on the search platforms ERIC, SciELO, and Science, with the keywords "emotion test and learning". The inclusion criteria for the selection of papers were open access studies, published in the last 5 years, that presented experiments with humans, with methods of measuring emotions and analysis of learning effectiveness. The search resulted in 264 publications, of which three studies were selected that met the requirements. Some studies used self-report questionnaires as a technique for measuring emotions and concluded that positive emotions favor learning, as well as negative emotions affect (Spec. Iss.2: 73,2020; FEM.23:359,2020). Furthermore, the connection between emotions and self-efficacy of students in a virtual classroom was also evaluated, using facial

expression recognition software (Spec. Iss. 10: 89,2018). The results of this study indicate that students who predominantly experienced positive emotions had higher levels of self-efficacy, in contrast, students who predominantly experienced negative emotions had lower levels. Two methods of measuring emotions with different characteristics were observed, the first one involving self-report through questionnaires and the other the real-time recognition of emotions from facial expressions. It's important to reflect that the questionnaires provide subjective data and the software objective data, but both are reliable and provide satisfactory results on the emotions experienced.

*ID: 5265*

*Área: Fisiologia Celular*

*Forma de Apresentação: Ê-POSTER*

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### **IN SILICO ANALYSIS OF FLAVONOIDS FROM SIPARUNA CRISTATA AGAINST SARS-COV-2 PLPRO: NATURAL PRODUCTS IN THE TREATMENT OF COVID-19**

Coronavirus SARS-CoV-2 may cause acute respiratory syndrome, leading people to death. Natural products may present antiviral activity; among them, flavonoids. This work describes in silico interactions between PLpro and quercetin (1), retusin (2), and kumatakenin (3) from extract of leaves of Siparuna cristata, in comparative against lopinavir (4), ritonavir (5) and chloroquine (6) interactions. The crystal structure for PLpro (PDBid 7JRN) was obtained from the Protein Data Bank and processed by the PDB2PQR server to assess the pKa prediction at pH 7.4. Redocking of GRL0617 and molecular docking were performed with AutoDock Vina. The parameters were centered in the GRL0617 inhibitor, found in the crystal structure. Grid centers  $x=13$ ,  $y=-9$ ,  $z=30$ , sizes  $x=30$ ,  $y=30$ ,  $z=30$ ; exhaustiveness=100, number of modes=20. The results were reclassified based on the distances in Å from with Y268, described as the main bonding interaction residue for PLpro. Redocking presented bind energy of  $-9.6$  kcal/mol and RMSD  $0.45356$  Å between the pose and the crystal original bind. Molecular docking simulations based on affinity energy and distances from Y268: 5,  $-6.9$  kcal/mol, distance  $1.6$ Å; 4,  $-5.7$  kcal/mol,  $1.8$ Å; 6,  $-5.9$  kcal/mol,  $1.1$ Å; 1,  $-7.2$  kcal/mol,  $2.2$ Å; 2,  $-5.5$  kcal/mol,  $1.9$ Å; and 3,  $-5.7$  kcal/mol,  $2.1$ Å. Interactions between PLpro and the ligand 2 may be favorable due the proximity of the -OCH 3 at C-3 from the Y268. Docking simulations have shown the SARS-CoV-2 PLpro BL2 loop having significant flexibility in ligandfree proteins. Residues N267, Q269 and Y268 account for most of this motion (Rev. Bras. Farmacognosia.35:1.2021). The results demonstrated interaction potential of flavonoids against key residues of PLpro, in a similar way to that of the screened potential inhibitors against COVID-19. 2 showed the best results in silico and in vitro assays. This study highlights the possible application of flavonoids as antiviral or adjuvant therapies in the treatment of COVID-19.

*ID: 5267*

*Área: Fisiologia Geral*

*Forma de Apresentação: Ê-POSTER*

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## PHYSIOLOGICAL EFFECTS OF CALF MUSCLE PUMP EXERCISE IN LOWER LIMB PERFUSION

Exercise is one of the main factors associated with the prevention of cardiovascular and disabling diseases. The objective of this study was to evaluate the physiological effects of two light movements (isometric plantar flexion and dorsiflexion) on feet perfusion, since regular exercise can promote an active lifestyle and help regulate lower limb hemodynamics. (CE.ECTS /P03.20). Twenty healthy young people participated in this study, with a mean age of  $24.6 \pm 3.7$  y.o. These were submitted to 2 protocols with 3 phases: Phase 1 (baseline) in the standing position for 5 min; Phase 2, in each protocol, 1min of isometric plantar flexion or 1 Dorsal Flexion Protocol (PFD) randomly attributed to each volunteer; Phase 3 recovery in the standing position for 5 min. Perfusion was assessed in both feet by Laser Doppler Flowmetry (LDF) and Polarized Spectroscopy (PS). The study was previously approved by the institutional Ethics Committee. Results have shown that in both protocols there was a significant increase in both feet perfusion during phase 2 (right PFP with  $p=0.005$  and left  $0.022$ ; and right PFD  $p=0.037$  and left  $p=0.005$ ) and CRBC measured with LDF (Right PFP with  $p=0.007$  and left PFD  $0.028$ ; and right PFD  $p=0.005$  and left  $p=0.005$ ). Results from PS were also significant but with an opposite direction, showing a perfusion decrease in phase 2 (right PFP  $p=0.013$  and left PFD  $0.028$ ; and right PFD  $p=0.007$  and non-significant left  $p=0.333$ ). In phase 3, values returned to baseline. Both protocols demonstrate the positive effect of exercise in perfusion and the fast post-exercise recovery with immediate adaptation to the standing position. Maintaining the contractile capacity of the calf muscle pump might contribute to preserve hemodynamic regulation. Nevertheless, further studies are needed to explore the physiological effects of exercise in microcirculation specially in dysfunctional limbs.

ID: 5268

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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## A “DO IT YOURSELF” SEQUENCE OF EXERCISE TO IMPROVE MICROCIRCULATORY PHYSIOLOGY

The functional impairment of the lower limbs is one of the main consequences of peripheral vascular disease. In this work, we analyzed the microcirculatory response of 3 different protocols in order to identify a structured sequence of exercises that can be performed at home by the patient, aiming functional recovery of the lower limb. Thirty healthy individuals were randomly distributed ( $n=10$ ) into 3 protocols with 3 phases - 1 (baseline), 2 (exercise) and 3 (recovery) in the standing position. Phase 2 of included 5 minutes of exercise (Protocol A, isotonic plantar flexion; Protocol B step in place, and Protocol C free walking in a predefined circuit). Procedures respected all the principles of good clinical practice being previously approved by the University's Ethics Committee. Perfusion measurements took place in both feet with Laser Doppler flowmetry (LDF) and polarized light spectroscopy (PS). A 95% CI was adopted. Results have shown that in the 1st minute of phase 3 the perfusion values measured with LDF are superimposed on the baseline values in all protocols. PS reveals that CRBC is even significantly lower in the 3 protocols (Protocol A with  $p=0.012$ ; Protocol B with  $p<0.001$ ; and protocol C with  $p=0.043$ ). At minute 5 the values no longer show significant differences. Recovery from deeper perfusion after light exercise appears to be slightly faster compared to more superficial. However, after the 2nd minute of recovery, the values are recovered, which shows the rapid capacity for hemodynamic regulation in healthy young individuals. Our results suggest that this exercise sequence with alternation between exercise and rest can be an interesting solution for the prevention / recovery of individuals with

reduced mobility and at different stages of DVP, promoting an active lifestyle.

ID: 5269

Área: Fisiologia Comparada

Forma de Apresentação: Ê-POSTER

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### **BLOOD LACTATE, NOT GLUCOSE, APPEARS TO BE A BIOMARKER OF CAPTURE-INDUCED PARTURITION IN A FRESHWATER STINGRAY**

Capture stress is the main factor that induces premature birth/abortion in elasmobranchs, and although it is a common consequence of fisheries, the physiological triggers involved in this response remain unknown. The aim of this study was to analyze biochemical stress parameters in a freshwater stingray, *Potamotrygon amandae*, in capture-induced parturition events. Pregnant and non-pregnant females (n=20) were collected in the Paraná River, Ilha Solteira, SP. After sampling, blood was collected and the animals were placed in plastic boxes. When there was a parturition, another blood collection was performed. Plasma glucose (mg/dL) and lactate (mg/dL) concentration was determined using measurement kits. Glucose was not significantly altered between groups and time, which were: pregnant females at the time of collection ( $18.5 \pm 8.4$ ), pregnant females after abortion ( $29.0 \pm 15.4$ ) and non-pregnant females ( $24.4 \pm 6.6$ ). In contrast, lactate had high values at the time of abortion ( $74.1 \pm 13.1$ ) compared to pregnant females at the time of collection ( $2.0 \pm 1.9$ ) and non-pregnant females ( $0.4 \pm 1.6$ ). Glucose and lactate are known as metabolic markers of secondary stress response and although glucose is used as an energetic substrate during the stress response, in this work, this marker did not show specificity of release in pregnant females before or after abortion and when compared to non-pregnant females. Lactate is released when aerobic respiration is insufficient for muscle cell response, which alternatively changes to anaerobic respiration, with formation of lactic acid. In this work, we observed a significant increase in lactate in pregnant females at the time of capture-induced parturition, which may be a marker of the intense contraction of the uterine smooth muscles and expulsion of the offspring. This study improves our understanding of capture-induced parturition process in stingrays, useful information for management strategies for elasmobranch conservation.

ID: 5271

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **EFFECTS OF PHYSICAL TRAINING ASSOCIATED OR NOT WITH L-ARGININE SUPPLEMENTATION ON METABOLIC AND OXIDATIVE PARAMETERS IN RATS WITH METABOLIC SYNDROME**

The union of several endocrine-metabolic, cardiac, and oxidative factors, increasing the cardiovascular risk, characterizes metabolic syndrome (MS). The oxidative stress is controlled by antioxidant defense system, and after an imbalance of redox system, an increase of inflammatory infiltration occurs. L-arginine (L-arg) is the substrate for nitric oxide (NO) synthesis and its uptake and availability are limiting factors to produce NO. In addition, the regular practice of aerobic exercise promotes various beneficial effects to the body, modulating NO bioavailability and antioxidant defense among others. That said, we aimed to evaluate the effect of physical training, with or without L-arginine supplementation on metabolic and oxidative profile in rats with MS. Adult Wistar male rats with SM (by monosodium glutamate model) or control were submitted to treadmill physical training and or L-arg supplementation for 8 weeks. After this, the animals were euthanized, and the organs were removed for oxidative and metabolic analysis. Approved by Animal Use Ethics Committee (CEUA/UEL: 130/2017). The results showed that Lee index and the perigonadal and retroperitoneal fats of MS animals were increased when compared to controls and physical training associated with L-arg supplementation reduced perigonadal and retroperitoneal fat. MS animals have a higher concentration of plasma fatty acids and training reduced this concentration. Also, the MS animal has greater hepatic steatosis and supplementation with L-arg associated or not with training was able to reduce it. Supplementation with L-arg associated or not with physical training or only training was able to improve the oxidative profile of MS animals. Statistical analysis used: 3-way ANOVA. Results were expressed as mean  $\pm$  SEM and significance were considered  $p < 0.05$ . We conclude that L-arg supplementation associated or not with physical training brings benefits to revert the metabolic and oxidative dysfunctions in MS animals.

ID: 5272

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### COMPARATIVE EFFECTS OF DEXMEDETOMIDINE AND PROPOFOL ON BRAIN AND LUNG DAMAGE IN EXPERIMENTAL ACUTE ISCHEMIC STROKE

Acute ischemic stroke (AIS) is associated with pulmonary complications. Dexmedetomidine and propofol are regularly used in neurointensive care but their immunomodulatory actions on the central nervous system and the lungs during AIS are unknown. Thus, the effects of dexmedetomidine and propofol on perilesional brain tissue and lung damage 24-hours after AIS in rats were assessed (CEUA 017/17). AIS was induced by thermocoagulation of pial vessels over the right primary sensorimotor cortex in 25 Wistar male rats. After 24 hours, 5 animals were euthanized for control; the remaining animals were randomly assigned to receive 1-hour infusion of dexmedetomidine or propofol. Lung and brain histology and molecular biology were performed. In addition, alveolar macrophages and lung endothelial cells were primarily extracted 24-hours after stroke and exposed (1-hour) to dexmedetomidine and propofol concentration equivalent to those used in vivo. IL-6 and IL-1 $\beta$  gene expression were evaluated. In the lungs, dexmedetomidine, compared to control, reduced diffuse alveolar damage score [median (interquartile range); dexmedetomidine = 12(7.8-15.3) vs. control = 19.5(18-24),  $p=0.007$ ], bronchoconstriction index [dexmedetomidine = 2.28(2.08-2.36) vs. control = 2.64(2.53-2.77),  $p=0.006$ ], and TNF- $\alpha$  expression, while propofol increased VCAM-1 expression compared to control. In perilesional brain tissue, dexmedetomidine, compared to control, decreased TNF- $\alpha$  ( $p=0.010$ ), while propofol increased VCAM-1 compared to control ( $p=0.024$ ). In alveolar macrophages and endothelial cells, IL-6 ( $p=0.002$ ) and IL-1b ( $p=0.040$ ) were lower after dexmedetomidine exposure compared to control. In endothelial cells,

dexmedetomidine yielded reduced IL-1b compared to propofol ( $p=0.014$ ). Dexmedetomidine, but not propofol, induced brain and lung protection in experimental acute ischemic stroke.

ID: 5274

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal do ABC (UFABC)

### **KLOTHO AMELIORATES CARDIAC CONTRACTION AND ARRHYTHMIAS DURING CRS TYPE**

3

Type 3 cardiorenal syndrome (CRS) is characterized by a primary acute kidney injury (AKI) that induces an acute heart injury. Cardiac contraction is regulated by changes in intracellular calcium ( $Ca^{2+}$ ) levels and mishandling of  $Ca^{2+}$  may be a consequence of type 3 SCR. Previous laboratory data showed that AKI caused by renal ischemia and reperfusion (IR) in mice is able to promote cardiac contractile changes and arrhythmias after 8 days of reperfusion. It became clear that klotho deficiency can be also associated with renal and cardiovascular events, so its replacement could provide protection against CRS incidents. Thus, the objective is to investigate the contractile changes caused by calcium imbalance generated by type 3 SCR and the effect of klotho supplementation in a renal IR model. For that, C57BL/6 mice males between 6 to 8 weeks, were submitted to renal IR by occlusion of the left renal pedicle for 60 minutes and reperfusion for 8 days, with or without klotho treatment (recombinant protein of 0.01mg/kg). Adults' cardiomyocytes were obtained by enzymatic digestion and observed in confocal microscopy, where intracellular  $Ca^{2+}$  dynamics and contraction were evaluated when electric stimulated (2Hz). Statistical analysis was performed using the ANOVA Newman-Keuls test of means  $\pm$  the SEM.  $P < 0.05$  was considered significant. Briefly, when compared with no treated animals, we could observe a partial reestablishment of the contractility and spontaneous calcium release profiles as well as prevention of transient calcium ( $F/F_0$ ) decrease and Tau increase in klotho-treated animals. Concerning arrhythmias, klotho treatment was able to improve the occurrence of arrhythmogenic events and incomplete transients in cardiomyocytes from mice that suffered renal IR. Taking into account the measures evaluated, treatment with klotho proved to be promising as cardio protector in a type 3 CRS model, playing an important role in the pathophysiology of this syndrome, by attenuating the harmful effects of IR on cardiac contraction, and by reversing the damage observed in the management of intracellular calcium and arrhythmias. This study has several potential clinical and therapeutic applications for renal patients.

ID: 5276

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal Fluminense (UFF)

### **EFFECTS OF HISTAMINE ON HUMAN CORONARY ARTERIES – A SYSTEMATIC REVIEW**

Histamine evokes vasoactive effects on cardiovascular system. Although H1 and H2 receptors are expressed on coronary arteries, their roles are not fully understood in humans. This review brings the state of art about the relative roles of the H1 and H2 on human coronary arteries. After exclusion of animal and review studies and language other than English or Portuguese, 10 articles were included. Studies demonstrated that histamine increases coronary blood flow and decreases coronary vascular resistance in subjects with healthy coronary arteries via H2-receptors and H1-receptors located in endothelium cells.<sup>1-6</sup> On the contrary, the stimulation of the H1-receptors located on the smooth muscle cells results in vasoconstriction.<sup>7-10</sup> Some patients with severe spontaneous angina or significant stenosis exhibit vasoconstriction after direct infusion of histamine in the coronary circulation.<sup>3,4</sup> Also, coronary vasodilation by histamine may be related with aging, as coronary rings removed from 73-years old subjects were more resistance to the vasodilator effect of histamine<sup>7</sup>. In vitro studies also showed that high doses of histamine evoke coronary vasoconstrictor response.<sup>7-10</sup> In conclusion, histamine mediates coronary vasodilation via H2-receptors and H1-receptors located in the endothelium cells, and vasoconstriction via H1- receptors expressed on smooth muscle cells. Histamine-mediated vasoconstriction seems to be associated with aging, cardiovascular diseases and high histamine doses.

ID: 5277

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual Paulista (UNESP)

### **THE ROLE OF LOCUS COERULEUS NOREPINEPHRINE LOSS ON PANIC-LIKE ESCAPE RESPONSE ELICITED BY EXPOSURE TO CO<sub>2</sub>**

It is well described that imbalance in the modulation of Locus coeruleus norepinephrine (LC-NE) neurotransmission are responsible for several psychiatric disorders, including panic disorder. Patients with such a disorder are more sensitive to changes in CO<sub>2</sub>/pH, and therefore, are more likely to experience the "suffocation false alarm" which, in turn, triggers the panic attack. LC-NE neurons are involved in ventilatory responses to CO<sub>2</sub>/pH, however, it's involvement in behavioral responses to acidification is still unknown. We investigated the participation of LC-NE neurons by using C56BL/6 mice with a conditional knockout allele of Dbh (DbhcKO) crossed with En1cre (En1CreDbhcKO - LC-NE mutants). In addition, an intermediate genotype animal of the same genetic background was used (WT DbhcKO) as well as control animals (WT/WT) of both sexes (10-12 weeks; 20-25 g). The animals went through a period of habituation in ambient air, followed by exposure to a mixture of gases enriched with 20% CO<sub>2</sub> during 7 min. The behavioral responses analyzed were escape (jumping/running) and time spent immobile (freezing). The experimental protocol was approved by the local ethics committee (CEUA - n° 3340/20). LC-NE mutants had a blunted jumping response (P=0.001) and more time spent in freezing (P<0.0001) compared to the other groups. Furthermore, LC-NE mutant animals had fewer racing episodes (P=0.028) compared to wild animals, but not different from WT DbhcKO group, that also presented a long freezing time, little movement and a small number of jumps. No sex difference was observed among groups. These findings suggest that norepinephrine originating from the LC has an important role in the paniclike escape response elicited in mice by exposure to CO<sub>2</sub> in a sex independent way.

ID: 5278

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### THE EFFECTS OF GLUTAMINE IN THE EXPERIMENTAL MODEL OF PARTIAL PORTAL VEIN LIGATION: INTESTINAL CHANGES IN PORTAL HYPERTENSION

Portal Hypertension (PH) is characterized by an increase in portal pressure, resulting from an obstruction in the portal venous system. Glutamine is an amino acid involved in different functions. The aim of this study was to evaluate the action of Glutamine in the large intestine of rats with PH, submitted to the experimental model of partial portal vein ligation (LPVP). Approved project: CEUA / HCPA 2014-0327. Twenty-four male Wistar rats  $\pm$  300g were used. The animals were divided into groups: SO, SO + GLU, LPVP, LPVP + GLU. The animals in the LPVP groups were prepared for partial portal vein ligation surgery. Glutamine was administered (Ip) on the 8th day after surgery, for 7 days, at a dose of 25 mg / Kg. On the 15th day of the experiment, portal pressure was measured, then, the animals were killed and the large intestine collected for histological analysis, assessment of TBARS and levels of nitric oxide metabolites. Statistical analysis was ANOVA followed by Student Newman Keuls test (mean  $\pm$  SE), significant when  $P < 0.05$ . In the portal pressure (mmHg) we observed an increase in the LPVP group ( $14.92 \pm 2.90$ ), when compared to the SO ( $7.71 \pm 0.19$ ) and SO+GLU ( $8.61 \pm 1.17$ ) groups, and a statistically significant decrease in the LPVP+GLU group ( $11.36 \pm 0.68$ ). In the evaluation of LPO by TBARS (nmoles/mgprot), there was a significant increase in the LPVP group ( $0.81 \pm 0.19$ ) compared to the SO ( $0.36 \pm 0.05$ ) and SO+GLU ( $0.31 \pm 0.03$ ), and a significant reduction in the LPVP+GLU group ( $0.33 \pm 0.02$ ). As for nitric oxide metabolites, there was an increase in the LPVP group ( $3.4 \pm 0.5$ ) compared to SO ( $0.6 \pm 0.1$ ) and SO+GLU ( $1.0 \pm 0.3$ ) and when administered Glutamine, there was a re-establishment in the levels of the LPVP+GLU group ( $0.5 \pm 0.1$ ). Histological analysis showed disorganization of the crypts and edema in the LPVP group; in the LPVP+GLU group there was a restoration of these damages. Judging by the results, glutamine proved to be able to attenuate the damage caused in this experimental model.

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Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### MELATONIN ACTION IN THE LIVER OF RATS WITH SECONDARY BILIARY CIRRHOSIS

Liver cirrhosis is characterized by fibrotic septa and nodules, structural and functional changes in the liver. The bile duct ligation (BDL) model mimics liver disease in humans within 28 days. Melatonin (MLT) is an indolamine with antioxidant and anti-inflammatory potential. Objective: To evaluate the effect of MLT on cellular redox homeostasis and the inflammatory process. Methods: Study approved: CEUA/ HCPA 2016-0373. Twenty-four male Wistar rats, aged 60 days and weight  $\pm$ 300 grams, divided into four

groups: CO (control), CO+MLT, BDL and BDL+MLT. The rats were treated with MLT from day 15 after BDL until day 28. On the 29th day, upon administration of anesthetic drugs, blood was collected for analysis of AST (U/L) and ALT (U/L) and liver tissue for analysis of lipoperoxidation (TBARS: nmoles/mg Prot), activity of the antioxidant enzymes superoxide dismutase (SOD: USOD/min/mgProt), catalase (CAT: pmol/min/mgProt), glutathione peroxidase (GPx: nmol/min/mgProt) and histological evaluation (HE-200 x). Statistical analysis: ANOVA+Student Newman Keuls, significant when  $p < 0.05$ . MLT decreased plasma levels of AST, ALT enzymes in the BDL+MLT group ( $117.5 \pm 18.8$ ;  $42.0 \pm 3.4$ ) when compared to BDL group ( $425.8 \pm 46.6$ ;  $105.8 \pm 13.5$ ) ( $p < 0.001$ ). TBARS levels decreased in the BDL+MLT group ( $0.46 \pm 0.01$ ) when compared to the BDL group ( $2.43 \pm 0.08$ ) ( $p < 0.001$ ). SOD activity increased in the BDL+MLT group ( $2.47 \pm 0.22$ ) compared to the BDL group ( $0.88 \pm 0.21$ ) ( $p < 0.001$ ) as well as CAT in the BDL+MLT group ( $2.46 \pm 0.04$ ) compared to the BDL group ( $1.09 \pm 0.01$ ) ( $p < 0.001$ ). GPx was restored in the BDL+MLT group ( $9.61 \pm 1.20$ ) compared to the BDL group ( $37.78 \pm 2.39$ ) ( $p < 0.001$ ). In histological analysis, MLT decreased the inflammatory process and fibrosis. Conclusion: There were no statistical differences compared to the control groups. MLT played a restorative role in treated animals compared to the control group, possibly due to its antioxidant and anti-inflammatory action.

ID: 5280

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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## **PREVENTIVE EXERCISE IMPROVES PANCREATIC CHANGES INDUCED BY TYPE 1 DIABETES MELLITUS IN OVARIECTOMIZED RATS**

Type 1 diabetes mellitus (DM1) induces changes in pancreatic islets, including changes of alpha and beta cells, increased expression of TGF- $\beta$ , nuclear factor kappa-B (NF-kB) and inflammatory cytokines. The impact of physical exercise on pancreatic lesions, especially during the period of decrease in female sex hormones, is little documented in DM1. This work evaluated the preventive effects of exercise on the pancreatic changes induced by DM1 in ovariectomized rats. Twenty-four Wistar female rats with 12-week-old, weighing 180 to 220g, were anesthetized and submitted to bilateral ovariectomy. The rats were divided into four experimental groups: ovariectomized sedentary control (OSC), ovariectomized trained control (OTC), ovariectomized sedentary diabetic (OSD), ovariectomized trained diabetic (OTD). The OTD and OTC groups were submitted to four weeks of aerobic exercise training on the treadmill before inducing DM with streptozotocin, (40 mg/kg, iv) or vehicle, respectively. After this period, DM was induced in the OTD group and this group continued the training for another 8 weeks. The animals were euthanized and the pancreas was collected for immunohistochemical studies. The experimental protocol was approved by the Animal Experimentation Ethics Committee IMS/UFBA (n° 008/2013). Our results show that physical exercise did not increase insulin content and  $\beta$ -cell mass in the islets of Langerhans of the DPTO group. However, exercise decreased glucagon expression and  $\alpha$  cell mass in the islets of DPTO rats compared to the DSO group ( $p < 0.05$ ). Exercise also decreased the expression of TGF- $\beta$ 1, NF-kB and TNF- $\alpha$  in the pancreatic islets of DPTO rats in relation to DSO ( $p < 0.05$ ). In conclusion, our study shows that exercise training promotes protective effects in pancreatic islets by reducing the expression of glucagon and fibrotic and inflammatory factors in ovariectomized rats with DM1.

ID: 5284

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER - Prêmio Álvaro

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Instituições: Universidade de São Paulo (USP)

### EFFECT OF LITHIUM CHLORIDE IN 6-OHDA PARKINSON'S DISEASE MODEL

Parkinson's Disease (PD) is a pathology characterized by loss of dopaminergic neurons in the substantia nigra (SN) and striatum (CPu) that has been winning attention recently due to being the neurological disorder with the fastest growth globally. In this context, a concern in testing drugs that may present potential neuroprotective effects raises. This study aimed to evaluate the effect of lithium chloride (LiCl) in dopaminergic neurons and investigate its influence in the expression of GSK-3 $\beta$  in the SN and CPu in a PD model induced by 6-OHDA. Mice were intraperitoneally treated with 4 mMol/kg/day of LiCl for 14 days. SN and striatum were collected and GSK-3 $\beta$  activity in the SN and striatum was evaluated by immunofluorescence, RT-PCR and immunoblotting (CEUA 7708010318). We found that 6-OHDA caused dopaminergic neuronal death in the SN, evidenced by tyrosine hydroxylase (TH) expression reduction compared to control animals. Animals that received 6-OHDA presented an increase in the Caspase-3 expression in the SN. We demonstrated that PD induction by 6-OHDA had no significant effect in GSK-3 $\beta$  mRNA nor in the active GSK-3 $\beta$  (Y216) in the SN and CPu at the 15th day after the lesion. On the other hand, LiCl treatment reduced Akt and Gsk-3 $\beta$  mRNA in animals treated with this compound. As a counterpoint, we found an increase in the GSK-3 $\beta$  phosphorylation (Y216) in response to LiCl treatment. This response may be related to the TH mRNA reduction in the SN of animals treated with LiCl. Altogether, these results suggest a new mechanism of LiCl neurotoxicity, in which GSK-3 $\beta$  (Y216) is increased in the cell bodies of dopaminergic neurons of the SN and that may have a correlation with the TH mRNA only in LiCl treated mice and not with the PD model. Our results indicate that the long-term LiCl treatment could contribute to emergence of deleterious GSK-3 $\beta$  phosphorylation-dependent effect to dopaminergic neurons in the SN, challenging LiCl use as a therapeutic strategy to PD.

ID: 5285

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### THE ROLE OF REACTIVE OXYGEN SPECIES IN THE NEURON REGENERATION PROCESS OF A MARINE ORGANISM

Neuron regeneration process is characterized by a restoring nervous tissue after an injury. Many cells and molecules are described to mediate the regeneration. Recently, reactive oxygen species (ROS) are taking place and have been trigger of key role. ROS are known as a product of cellular metabolism and for the oxidative damages. Furthermore, few workers have been reported their function in the neurogenesis, outgrowth and neuronal plasticity. To address this hypothesis, we evaluate the role of ROS after chemical injury in the ascidian *Styela plicata* brain. The injury was induced by a systemic injection of 65 mg/kg 3-acetyl pyridine and, after 1/2, 1, 3, 5, 7 and 10 days, the brain was dissected

and analyzed by histochemical and biochemical methods. To detect the production of ROS was used 2',7'-dichlorofluorescein-diacetate and to detect superoxide ( $O_2^-$ ) a histochemistry was performed using 2% nitroblue tetrazolium. The enzymes activities of superoxide dismutase (SOD) and catalase (CAT) were assessed. To analyze the proliferation and synapses an immunohistochemistry using the antibodies anti-ki67 and anti-synaptophysin was performed. The results revealed an increased in 3.55 and 5.11 folds of ROS concentration at  $\frac{1}{2}$  and 5 days, respectively. The  $O_2^-$  histochemistry quantification showed control values of  $2.87 \pm 0.86\%$  and, 5 days after injury there was an increase to  $33.45 \pm 3.21\%$ . The SOD ( $46.22 \pm 3.05$  U/mg) and CAT activities ( $40.35 \pm 3.50$  U/mg) increased in the brain of ascidia at 5 day compared to the control ( $22.63 \pm 2, 63$  U/mg and  $40.35 \pm 3.50$  U/mg), respectively. Was observed a progressive high staining to KI67, a cell proliferation marker and to synaptophysin after 3 days compared to  $\frac{1}{2}$  day, a peak of degeneration. However, after 10 days the labeling returns close to the parameters observed in the control group. In conclusion, ROS play an important role in the central neuron regeneration events and may be working as a signaling molecule which promotes synaptogenesis.

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Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

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### **HIGH FAT DIET ALTERS THE ANDROGENIC AND INFLAMMATORY RESPONSE IN THE PROSTATE OF PPAR $\alpha$ KNOCKOUT MICE SUBMITTED TO AEROBIC EXERCISE**

The high-fat diet (HFD) leads to the development of metabolic, hormonal, protein, and tissue disorders, promoting progression cellular prostatic. Thus, PPAR $\alpha$  promote regulation of cell homeostasis and the lipid profile, and its absence impairs  $\beta$ -oxidation. The aerobic exercise used to prevent prostate damage, maintaining prostate cell homeostasis, in addition reducing visceral fat and body weight. The aim was to verify the effects of HFD on inflammatory cytokines and the androgen receptor in the prostate of PPAR $\alpha$ -/- mice submitted to aerobic physical exercise. 40 male C57BL/6J wild mice and Knockout PPAR $\alpha$  mice were divided: WT-SD groups (standard diet/WT); WT-HF (HFD/WT); WT-HFT (HFD/Training/WT); KO-HF (HFD/PPAR $\alpha$ KO); KO-HFT (HFD/training/PPAR $\alpha$  KO), CEUA protocol 112/13. At 70 days, supplementation with HFD (26% of carbohydrates, 59% of lipids and 15% of protein) was started for 4 weeks, and the maximum speed test was performed to determine the intensity. From the 5th week, physical training was performed on a treadmill 60min/5x/week for 8 weeks, at the end of the protocol, at 155 days the animals were euthanized, the prostate was processed for immunohistochemistry. HFD increase in inflammation by increasing the IL-6, TNF- $\alpha$  and NF-KB in epithelial cells of WT animals, however aerobic exercise training reduces this inflammation. In KO increase in inflammation caused by HFD is greater, increasing the risk of tissue damage and prostatic changes. The HFD significantly increased AR expression in both strains with HFD. However, aerobic physical training reduced AR, reducing tissue damage. We conclude that the absence of PPAR $\alpha$  together with HFD damages the inflammatory response and enhances the androgenic activity. In WT animals, the HFD also impairs the inflammatory and androgenic response, however, aerobic exercise was efficient in reversing this negative effect, proposed as a non-pharmacological agent in the prevention of prostatic changes and systemic metabolic damage.

ID: 5288

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### DIETARY REGIME INFLUENCES THE SKIN CAROTENOIDS CONTENT – DATA FROM OMNIVORE AND VEGETARIAN COHORTS COMPARISON

Carotenoids are provitamins A present in human tissues, especially in the skin. Due to its recognized antioxidant activity carotenoids have been pointed as main elements of the antioxidant barrier essential to protect against environmental aggressors and prevent accelerated ageing. Carotenoids supplementation has been referred as an important element of a proper cutaneous condition, although a limited number of studies approached this hypothesis. The present study aimed to investigate the influence of vegetarian-vegan and omnivorous diets on skin carotenoids content and cutaneous physiology. After the approval by the institutional Ethical Commission and informed written consent, 66 healthy volunteers both sexes were recruited. These included 37 omnivores ( $22.11 \pm 2.68$  y.o.) and 29 vegetarians ( $34.55 \pm 13.73$  y.o.) with similar body weight ( $23.14 \pm 3.75$  kg and  $23.17 \pm 3.82$  kg, respectively). Carotene skin content was determined in each hand's palms by contact spectroscopy (Biozoom® GmbH). In the forearm we also measured transepidermal water loss (Tewameter CK electronics) hydration (Moisturemeter DTec, UK) and biomechanics (CutiScan® CK electronics). The mean consumption of vegetables in the vegetarian-vegan group was  $403.4 \pm 103.8$  g/day, compared with  $242.1 \pm 161.4$  g/day in omnivores, meaning a significantly higher content of skin carotenes in the vegetarians-vegan group ( $p < 0.01$ ). Other skin functional differences could not be found. However, some slight differences involving a decrease in TEWL was noted in vegetarians-vegan skin. More studies are needed to better understand the correlations between dietary patterns, carotenes and skin health.

ID: 5289

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### RELATIONSHIPS BETWEEN DYNAMICAL MOVEMENT AND SKIN PHYSIOLOGY

Effects of physical exercise on skin physiology is controversial. Some dermatological disorders seem to get worse with physical activity while some reports refer an opposite impact. Apparently, effects depend on type, intensity and duration of the specific activity. Therefore, our study was designed to better understand how moderate dynamical movements, such as walking, impact skin microcirculation and basic functional indicators. Healthy volunteers ( $39.3 \pm 16.4$  y.o.) both sexes previously selected after informed written consent, performed a regular gait on a treadmill (4 Km/h). The applied protocol included three phases - a 5 min resting phase seated (Phase 1, baseline), a 5 min walking on the

treadmill (Phase 2), and a 5 min seated post-walk (Phase 3, recovery). Perfusion was measured by laser Doppler flowmetry (LDF) and Polarized Spectroscopy (PS). Other skin physiological variables included biomechanics (CutiScan) and transepidermal water loss (TEWL, Tewameter TM300). All measurements were done on the dorsal aspect of the foot (specific area close to the 3rd and 4th toes). All procedures were submitted to the institutional Ethical Commission. Non-parametric tests (Wilcoxon) were used, adopting a 95% significance level. Results have shown that walking evoked significant perfusion increases (LDF and PS) still present 3 min after finishing the exercise. Regarding skin indicators a consistent decrease in skin elasticity and viscoelasticity was detected, while no changes were detected for TEWL - a direct indicator of the epidermal "barrier". Perfusion and skin parameters returned to baseline levels after 5 min. (end of Phase 3). Our results suggests that a direct relationship might be established between gait and these skin parameters, although further studies are needed to better understand its mechanisms and significance using different intensity, time of gait and comparisons between sex, lifestyle and age.

ID: 5293

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## **SMALL EXTRACELLULAR VESICLES MIRNAS CONTENTS IN SERUM FROM OBESE FEMALE DOGS**

Alterations in microRNAs (miRNAs) levels have been detected in many diseases. Obesity can induce up or downregulation of miRNAs present in small extracellular vesicles (EVs), including the miRNAs involved modulating inflammation and metabolism. The aim of this work was to compare blood inflammation markers, lipidic profile and selected miRNA levels in EVs separated from serum of obese and lean female dogs. Obese group consisted of 7 neutered female and with body condition score (BSC) of 8 or 9. Control group consisted of 5 neutered females with BSC 5 and normal physical and laboratory examination. Blood was collected for determination of white blood cells (WBC), plasma fibrinogen (by clot formation method), C-reactive protein (CRP) (by ELISA), and serum triglycerides and cholesterol (by spectrophotometry). EVs were isolated from serum samples by ultracentrifugation. Expression analysis of 3 candidate miRNAs (miR-26b, miR-132, and miR-155) was quantified with reverse transcription PCR assay. The miRNAs relative expression was normalized by miR-99b and RNT43 snoRNA (endogenous control). Comparison between groups was made using the unpaired t-test ( $p < 0.05$ ) (CEUA protocol 1940130519). WBC, plasma fibrinogen concentration and CRP concentration did not differ between groups. Serum cholesterol and triglycerides concentration was higher in the obese group compared to control ( $264 \pm 79.2$  vs  $175 \pm 38.9$  mg/dL, and  $251 \pm 114.7$  vs  $45 \pm 10.07$  mg/dL, respectively) ( $p < 0.05$ ). No differences were observed in relative expression of miR-26b and miR-132 in EVs, but relative expression of miR-155 in EVs was significantly higher in the obese group than in control ( $2.07 \pm 0.79$  vs  $0.83 \pm 1.12$ ;  $p = 0.0472$ ). The increased expression of miR-155 in EVs was not related to inflammatory markers, but it may have been induced by dyslipidemia.

ID: 5301

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### DIETARY CITRATE AGGRAVATES WESTERN DIET-INDUCED INSULIN RESISTANCE IN MICE

Obesity is a nutritional disorder considered as a health problem worldwide. The increase in the number of cases is related to a sedentary lifestyle and contemporary dietary change, called "Western diet", characterized by ultra-processed foods overloaded with sugars, salt, fat, and additives. Among these additives, citrate is the most used by food industry as it's an inert compound present in the body. Yet, the metabolic fate of dietary citrate overload is unknown, but an acute treatment of citrate alters hepatic metabolism, with markers of insulin resistance. This study evaluates the effects of medium-term citrate consumption on glucose tolerance, obesity and in liver metabolic profile and WAT physiology. C57BL/6 mice were treated for 12 weeks with Chow or HFHS diet, with or without citrate. During the 12 weeks, animals were weighed and submitted to GTT. Liver lipid accumulation and damage were analyzed by biochemical dosage, histology, and WB. It was observed that HFHS+Cit led to increased food intake as compared to controls. Impaired glucose tolerance induced by HFHS diet did not affect HFHS+Cit after 12 weeks treatment on oGTT test, but changes were observed on ipGTT tests. However, ITT assay showed that the HFHS group had a change in insulin response, whereas the HFHS+Cit group had a delay on insulin challenge response. Despite HFHS+Cit presented increased ALT levels in plasma, a marker of liver damage, the liver weight is unaffected by HFHS+Cit as compared to HFHS. Yet, both groups accumulate TAG and CHOL in the liver, as compared to Chow. We observed, both in the liver and in eWAT, a decrease in insulin-induced phosphorylation of AKT, mTOR, ACC and ACLY, and in expression of SCD1, suggesting that insulin dependent pathways are compromised by the treatment with citrate. To better understand the influence of exogenous citrate on a chronic basis, molecular analysis of the main metabolic pathways both in the liver and in the WAT is necessary.

ID: 5302

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### EFFECTS OF ANDROGEN DEPRIVATION BY CASTRATION ON ACID PHOSPHATASES ACTIVITIES IN THE SALIVARY GLANDS OF MALE RATS

Phosphatases are enzymes involved in the molecular mechanisms of several diseases, as they play roles in controlling cell proliferation, growth and differentiation. This research aimed to analyze the effects of orchietomy (ORX) on phosphatases activities in the salivary glands. Twenty male Wistar rats (*Rattus norvegicus albinus*) (3 months old) were divided into two groups (weight 405 – 445 g, n=10/group): bilateral orchietomy (ORX) or Sham. After 8 weeks of castration, the animals were anesthetized

for saliva collection induced by pilocarpine and subsequently euthanized for exeresis of the salivary glands, which were weighed and stored at  $-80\text{ }^{\circ}\text{C}$  (Protocol CEUA – FOA/UNESP No. 0252-2021). Saliva was used to measure salivary flow rate (SFR), and amylase activity (AMY). In the glandular homogenates, the activities of total acid phosphatase (TAP), tartrate-resistant acid phosphatase (TRAP), and phosphotyrosine protein phosphatase (PTP) were analyzed by the p-nitrophenyl phosphate spectrophotometric method. The Student's t-test was used to compare the means. SFR increased 33% and AMY activity reduced 25% in the ORX group. TAP remains unchanged, while TRAP decreased 18.5% and PTP increased 15% in the submandibular glands after castration. In sublingual glands, the TAP (27%), TRAP (33%) and PTP (31%) activities were lower in the ORX group compared to Sham. No significant differences in phosphatases activities were found between groups in the parotid glands. Testosterone depletion ORX-induced caused a secretory dysfunction of the salivary glands. Furthermore, these results indicate that phosphatase isoforms could be biomarkers of alterations induced by ORX in the submandibular and sublingual glands.

*ID: 5313*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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### **SHELL NUCLEUS ACCUMBENS NEURONS ARE INVOLVED IN CARDIOVASCULAR AND MICTURITION CONTROL**

**Introduction:** Rostral regions of the dorsomedial shell Nucleus Accumbens (NAcc) project to the lateral preoptic area (LPA). Angiotensin-(1-7) injected into the LPA evokes a huge increase in intravesical pressure (IP). **Aim:** To investigate the possible involvement of shell NAcc in the micturition control. **Methods:** All protocols were approved by CEUA-CUFMABC (09/2020). Adult male Wistar rats (~450 g) with stainless steel guide cannulas implanted bilaterally in the shell NAcc 7 days prior to the experiments were isoflurane anesthetized and subjected to cannulation of the femoral artery and vein for mean arterial pressure (MAP) and heart rate recordings (HR) and infusion of drugs, respectively. The urinary bladder was cannulated for IP measurement. A miniaturized Doppler flow probe was placed around the left renal arterial for renal blood flow (RBF) recordings. After the baseline MAP, HR, IP and RBF recordings for 15 min, GABA (50 mM, 1  $\mu\text{L}$ ) or L-glutamate (50 mM, 1  $\mu\text{L}$ ) or saline (vehicle, 1  $\mu\text{L}$ ) injections were made bilaterally into the shell NAcc and the variables were measured for additional 30 min. Data are as mean $\pm$ SEM and submitted to Student's t test ( $P<0.05$ ). **Results:** Bilateral injections of GABA into the shell NAcc significantly increased IP ( $168\pm 11\%$  vs.  $5\pm 3\%$ , saline) and renal conductance (RC,  $124.67\pm 23.51\%$  vs.  $5.45\pm 0.90\%$ , saline), whilst a significant fall in MAP ( $-64\pm 2$  mmHg vs.  $-2\pm 2$  mmHg, saline) and HR ( $-92\pm 14$  bpm vs.  $1\pm 2$  bpm, saline) were observed compared to saline injections. Bilateral injections of L-glutamate into the shell NAcc significantly increased IP ( $132\pm 18\%$  vs.  $5\pm 3\%$ , saline), and MAP ( $13\pm 3$  mmHg vs.  $-2\pm 2$  mmHg, saline), whereas a significant decrease in RC ( $-7.39\pm 0.58\%$  vs.  $5.45\pm 0.90\%$ , saline) and no changes in HR ( $13\pm 6$  bpm vs.  $1\pm 2$  bpm, saline) were observed compared to saline injections. **Conclusion:** The shell NAcc participates in the neural circuitry involved in micturition control and plays a possible tonic role in the arterial pressure regulation.

ID: 5314

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de Sergipe (UFS)

### STUDY OF THE ACTION OF THE ADRENAL GLAND IN THE DEVELOPMENT OF DIFFUSE CHRONIC MUSCULAR HYPERALGESIA

Chronic pain is a cognitive-emotional sensation of durability above what is considered normal. Possible hyperexcitability mechanisms of the excitatory nociceptive pathways are considered as a possible cause of the development of the syndrome. Furthermore, it is presumed that functional changes in Hypothalamus-hypophysis-adrenal axis (HPA axis) could contribute to mechanisms of chronic pain, although it is not clear how. The aim of the study is to evaluate the influence of corticoids in adrenalectomized rats with chronic and diffuse hyperalgesia. Research project was accepted by the Ethical Committee in animal research (7031290519). Wistar female rats, with 2 to 3 months, weighing 200-250g were splitted in: control group (CTRL); hyperalgesia (FIBRO); SHAM; adrenalectomized (ADX); adrenalectomized treated with dexamethasone 2.5%(ADX+DEX) (n=6). SHAM, ADX and ADX+DEX groups were induced to chronic hyperalgesia, the first injection managed five days after surgery. Dexamethasone were managed: single dose(acute) and for two doses/day during seven days(chronic). The behavioral analysis used: Activity monitor, hot plate, electronic Von Frey. T Test was used for acute, one way and two way ANOVA with Bonferroni post-test for chronic. The travel distance was reduced only for ADX+DEX in chronic conditions. Likewise, thermal latency was lower only for acute and chronic on ADX+DEX. The paw removal threshold was lower for both left and right paws for groups: FIBRO, SHAM and ADX+DEX, again in both treatments. The results confirm the influence of the adrenal gland in modulating hyperalgesia, since adrenalectomized animals did not show hyperalgesia. Our data suggests that dexamethasone treatment was not effective in reversing the chronic hyperalgesia. On the contrary, chronic treatment with dexamethasone promoted a more accentuated state of thermal and cutaneous hyperalgesia, suggesting direct and important adrenal gland action on hyperalgesia.

ID: 5315

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### THE VENTRAL TEGMENTAL AREA STIMULATION FACILITATES THE EXTINCTION OF AVERSIVE MEMORY BY DOPAMINE RELEASE

The ventral tegmental area (VTA) is essential to dopamine release in the hippocampus, and this neurotransmitter facilitates the aversive memory extinction. Our objective was to evaluate the effect of VTA modulation on aversive memory extinction and dopamine levels in rats' hippocampus. We used male Wistar rats (Ethical Committee #018/2017). On the first day, the animals were trained in inhibitory avoidance (IA), receiving an electrical stimulus (0.7mA, 2s) after stepping down the platform. On the

second day, we conducted the aversive memory extinction protocol (which alone does not promote memory extinction). Extinction consisted of three sessions with an interval of 90 min in which rats did not receive electrical stimulation and were able to explore the environment for 30s after stepping down the platform. To investigate the VTA extinction modulation, the animals (n = 8/group) received infusions of NMDA (glutamatergic agonist) or muscimol (gabaergic agonist) in VTA 30 min before the first extinction session. An aversive memory retention test was performed 24h, 3, 7, 14, and 21 days after. We also verified the dopamine levels in the hippocampus (n = 4/group) 30min after the drug infusions. The Wilcoxon test was used to compare the IA latencies; and ANOVA and Dunn's posthoc test to evaluate biochemical data. Significance was considered when  $P < 0.05$ . In the 24h retention test, the IA latency of the saline and muscimol groups was higher than the training day ( $P = 0.0039$ ;  $P = 0.0078$ ), indicating no memory extinction when VTA is inhibited. When infused with NMDA, step down latency was similar to the training day ( $P = 0.0938$ ); so, VTA stimulation facilitates aversive memory extinction. The aversive memory extinction induced by NMDA persisted for at least 21 days. NMDA increases dopamine levels in the hippocampus ( $P = 0.0003$  vs. control;  $P = 0.0186$  vs. muscimol). In conclusion, the stimulation of VTA facilitates the aversive memory extinction by dopamine release.

ID: 5316

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP)

## TRANSIENT RECEPTOR POTENTIAL V1 (TRPV1) CHANNEL REGULATES LIVER CIRCADIAN PHYSIOLOGY AND GLUCOSE HOMEOSTASIS

TRP channels, a nonselective cation channels, are involved in a variety of metabolic events. Lack of TRPV1 contributes to high plasma glucose levels and insulin resistance in high fat diet (HFD) fed mice. Metabolic processes including glucose metabolism are under the control of the circadian system, which is ensured by interlocked transcriptional-translational feedback loops. We hypothesized that TRPV1 channel regulates clock functioning and glucose metabolism. Mice were single housed in 12:12 light-dark cycle at  $22\text{ }^{\circ}\text{C} \pm 1$ , with water and food ad libitum, and were euthanized at ZT8 and 20 (ZT0 as 7 AM) (CEUA 350/2019). In the absence of Trpv1 channel, Per1 mRNA was reduced at ZT8 while Glut2 was increased at ZT 8 in comparison to WT mice. Although Glut2 expression has been increased at ZT8 we found a reduction in hepatic glycogen storage in Trpv1 KO mice in comparison to WT mice. So, we analyzed hepatic insulin signaling genes, Gsk3b and Akt, and Pepck, a main player of the gluconeogenesis signaling. It was observed increased transcription levels of Gsk3b and Akt at ZT8 while no differences in the protein levels were observed in total AKT or phospho-AKT in the absence of Trpv1 channel. Interestingly, the mRNA but not protein of PEPCK was increased in liver of mice lacking TRPV1 channels. Pathways-based interactome network and circadian rhythmicity analyses pointed CREB signaling as a possible link between TRPV1 channel, circadian rhythmicity, and glucose homeostasis. Corroborating our bioinformatic data, CREB phosphorylation was increased in the liver of Trpv1 KO mice only at ZT20. We have shown that TRP channels are important players in the control of the clock machinery and contribute to hepatic glycogen mobilization, which could suggest increased glucose consumption or reduced glycogen storage in the absence of TRPV1 channels.

ID: 5317

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade de São Paulo (USP) - Instituto de Ciências Biomédicas (ICB)

### SUBSTANCE P INJECTION IN THE PARAFACIAL REGION ACTIVATES BREATHING IN MICE

Ventilation is a process initiated in the central nervous system, essential for maintaining the body's homeostasis, especially regarding the regulation of O<sub>2</sub> and CO<sub>2</sub> levels in blood and tissues. It is well established that the central and peripheral chemoreceptors detect changes in the concentrations of arterial blood gases and transmit this information to respiratory centers in order to regulate ventilation. Recently, based on functional differences, we subdivided neurons juxtaposed to the facial nucleus into two distinct populations, the parafacial ventral (pFV) and lateral (pFL) regions. Little is known about the composition of these regions, especially the existence and differences of tachykinergic signaling to control breathing output. Here, we manipulated their excitability in spontaneously breathing and urethane anesthetized adult male C57/BL6 mice (20-25 g; N = 3-6/group, CEUAICB/USP n° 2781260620) to further characterize their role in breathing by recording external intercostal muscle activity (IntEMG). We demonstrated experimentally that the injection of Substance P (SP, 1 µM - 30 nL) into the pFV elicited an increase in IntEMG frequency (18.3±5.3, vs. saline: -1.2±0.8%) and amplitude (38.3±11.6 vs. saline: -1.95±2.5 %). Injection of SP laterally in the pFL elicited a decrease in IntEMG frequency (-14.8±2.9 vs. saline: -0.85±0.85%) and an increase in IntEMG amplitude (28.1±14.1 vs. saline: 3.7±3.7%). The changes in breathing elicited by SP either in pFV or pFL was completely blocked after previous injection of NK1 antagonist (GR82334, 100 mM - 30 nL). These results suggest that tachykinin signaling exerts different effects on breathing frequency depending of the site of injections in the parafacial region.

ID: 5319

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal Fluminense (UFF)

### EXERCISE DETRAINING IN OLDER WOMAN: THE IMPACT ON CARDIO-POSTURAL CONTROL AND BLOOD PRESSURE ADJUSTMENTS DURING ACTIVE STANDING

INTRODUCTION: Exercise detraining is characterized by the total or partial loss of the physiological adaptations obtained with physical training, and may have a negative impact on the elders. Postural instability during orthostasis depends on the mechanisms of postural and cardiovascular control to prevent syncope or falls in older subjects. The effects on cardio-postural control gains and losses after training or detraining are still unknown in this population. AIM: The purpose of study was to evaluate the effects of ten weeks of aerobic exercise training and ten weeks of detraining on postural control and cardiovascular responses to active standing in older women. METHODS: Fifteen healthy women (64 ± 7 years) performed a maximal exercise test on cycle ergometer to evaluate the peak of oxygen consumption (VO<sub>2</sub>peak) and active orthostatic test (ORT) to investigate the cardio-postural control.

The volunteers underwent the tests before training (PRE), after ten weeks of rowing training (+10w), and after ten weeks of detraining (-10w). Heart rate (HR) and Systolic blood pressure (SBP) were continuously measured from a standard electrocardiogram (ECG) and infrared finger plethysmography, respectively, at rest (10min) and during active standing (7min). During ORT the center of pressure (COP) displacements were measured. In the first 30s of ORT (onset), the transient drop and recovery of SBP were analyzed and the time of transient drop. The physical training protocol (indoor/simulated rowing) consisted of three weekly sessions of 30 minutes at 60-80% of the maximum HR. One-way ANOVA for repeated measurement and Tukey's post-hoc were employed ( $\alpha \leq 0.05$ ). RESULTS: The  $VO_2$  peak ( $p \leq 0.001$ ) and COpeak ( $p \leq 0.004$ ) increased after + 10w and decreased by -10w. Onset analysis showed that COP was reduced after +10s and increased after -10s in distance (mm) ( $p < 0.01$ ) and speed (mm/s) ( $p < 0.01$ ). The SBP during the postural transition, presented a smaller transient drop at +10w and higher values at -10w ( $p < 0.01$ ), this same behavior was observed in the recovery of the transient drop ( $p < 0.01$ ). The PAS oscillation time also reduced by +10w and increased by -10w ( $p < 0.05$ ). DISCUSSION AND CONCLUSIONS: Aerobic training in rowing ergometer decreased postural instability and transient drop of systolic blood pressure during the onset of orthostatic stress in older women. These changes suggest a better body balance control, reducing the risk of falls. However, the physiological adaptations were reversed after ten weeks of detraining.

ID: 5320

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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#### **HFD-INDUCED OBESITY CAUSES HPA AXIS HYPORESPONSIVENESS TO FASTING ASSOCIATED WITH REDUCED mRNA EXPRESSION OF CRF IN THE PVN AND AGRP/NPY IN THE ARC OF MICE**

Fasting-induced metabolic stress increases the activity of the hypothalamic-pituitary adrenal (HPA) axis, while treatment with exogenous leptin reduces fasting-induced corticosterone secretion. Leptin actions on the HPA axis are mediated, at least in part, by the changes in the activity of protein related to agouti/neuropeptide Y (AgRP/NPY) and proopiomelanocortin (POMC) neurons in the arcuate nucleus (ARC). On the other hand, diet-induced obesity causes resistance to leptin signaling and, consequently, to its actions. So, we investigated the HPA axis responsiveness to fasting in High Fat Diet (HFD)-induced obesity animals, as well as the expression of genes in the paraventricular (PVN) and ARC nuclei involved in the control of HPA axis activity. To this aim, male C57/black mice (19-24g, n=3-10/group) were fed with control (CTR, 3.8 kcal/g) or HFD (5.21 kcal/g) for 13 weeks. After this period, part of the animals from each group were fasted for 36h and the remaining animals were fed *ad libitum*. Right after, the animals were decapitated for blood collection to plasma corticosterone and glucose levels determination and the brain tissue for gene expression studies. We observed lower body weight loss in HFD animals compared to the CTR group, both fasted. Interestingly, we did not observe increase in plasma corticosterone levels in HFD fasted animals, compared to their respective fed group. We observed a similar decrease in glycemia in both, CTR and HFD fasted animals. Regarding to mRNA expression studies, food deprivation increased *Crf* mRNA expression in the PVN and *Agrp* and *Npy* in the ARC of CTR animals, but not in the HFD group. We observed similar mRNA expression of *Gad65*, *Gad67* and *Pomc* in the ARC of the different

groups. Our data indicate that HFD-induced obesity is associated with HPA axis hypo responsiveness to metabolic stress, induced, at least in part, to the absence of a change in the gene expression of *Agrp/Npy* of ARC and *Crf* of PVN.

ID: 5321

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Lusófona de Humanidades e Tecnologias

### NEW INSIGHTS FROM THE POST-OCCLUSIVE REACTIVE HYPERAEMIA FROM MULTISPECTRAL OPTOACOUSTIC TOMOGRAPHY

Post-occlusive reactive hyperaemia (PORH) became a widely used strategy to assess in vivo microvascular physiology. PORH provides a quantification of limb reperfusion after a period of proximal vascular occlusion by a cuff with suprasystolic pressure. The arm or the finger are preferred areas for occlusion with measurements taking place in the forearm or at the fingertip respectively. Single-point measurements of flow using plethysmography and laser Doppler (flowmetry and imaging) has been the reference no matter the known reproducibility limitations - the reduced focal region involved, different lasers measure at different depths, different acquisition time. Moreover, there is no agreement regarding the best measurement variables. Doppler ultrasound, near infrared spectroscopy or peripheral artery tonometry, provided better temporal and spatial resolution but, choosing the best descriptor is still a problem. The present study provides a new insight into PORH through this multispectral optoacoustic tomography (MSOT) a technology that gathers a good functional contrast of the optical spectrum, real-time operation and good spatial resolution in deep tissues. We use MSOT for monitoring the progressive impact of the increased pressure in the in vivo human forearm. Healthy individuals (n=9) both sexes and different ages were assessed during increasing cuff-pressure (up to 200 mmHg). Data from 1.5cm tissue deep and microvasculature up to 600µm in diameter were reconstructed and analyzed. Proposed endpoints are maximal Oxygenated Hemoglobin (Max HbO<sub>2</sub>) maximal deoxygenated Hemoglobin (Max Hb), Recovery Efficiency (RE) (reperfusion rate), Recovery Slope (RS) and Maximal Recovery Time (Max RT). These new analytical endpoints seem to provide much more information on the regional area of interest, regarding this wide spatial and temporal resolution. The potential clinical value foreseen for vascular medicine is huge and should be explored.

ID: 5322

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual Paulista (UNESP)

### ROLE OF CRF2 RECEPTORS IN THE LATERAL HYPOTHALAMUS IN CARDIOVASCULAR RESPONSES DURING ACUTE AND REPEATED RESTRAINT STRESS IN RATS

Studies have shown the involvement of lateral hypothalamus (LH) in the cardiovascular responses to aversive stimulus. The corticotropin-releasing factor (CRF) system has been shown to be an important neurochemical mechanism in the central nervous system involved in the etiology of the physiological adjustments evoked by exposure to aversive situations. The exposure to chronic stress affects the expression of CRF neurotransmission components in brain regions involved in the control of stress responses. However, the role of CRF neurotransmission within the LH in the cardiovascular responses during acute and repeated restraint stress (RS) has not been investigated. Here, was investigated the effect of bilateral microinjection into the LH of the selective CRF2 receptor antagonist ANTISAUVAGINE-30 (ASV-30) in the cardiovascular responses induced during the first and the 10th session of RS in rats. For this, male Wistar rats (250g) had cannula-guide bilaterally implanted within the LH. A catheter was implanted into the femoral artery for mean arterial pressure (MAP) and heart rate (HR) recording; and the tail skin temperature was recorded by a thermographic camera. The RS was realized by placing the animals in a plastic cylindrical tube for 60 minutes. Independent sets of animals received ASV-30 (0.01 mol/100nL) or vehicle into the LH 10 minutes before the onset of the first or 10th session of RS. Bilateral microinjection of ASV-30 into the LH did not alter the increase in MAP ( $F(1, 29) = 2.99, P > 0.05$ ) and the drop in the tail skin temperature ( $F(1, 29) = 0.23, P > 0.05$ ). However, the treatment decreased the restraint-evoked tachycardiac response ( $F(1, 29) = 8.98, P < 0.006$ ) and the post-hoc analysis revealed effect during both the acute ( $P < 0.05$ ) and 10th ( $P < 0.05$ ) sessions of RS. The results obtained indicate that CRF neurotransmission in the LH acting through activation of local CRF2 receptors is involved in control of the tachycardiac response during aversive threats.

*ID: 5323*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Lusófona de Humanidades e Tecnologias*

### **IN VIVO MICROVASCULAR TRANSLATIONAL IMAGING - IMPRESSIONS FROM MULTISPECTRAL OPTOACOUSTIC TOMOGRAPHY (MSOT)**

Microcirculation is essential for cell viability and organ functions. These vessels can actively adapt to global hemodynamics while influencing systemic circulation. This is the basis of hemodynamical homeostasis, a fine balance involving cardiorespiratory performance, systemic vascular resistance, and local microcirculatory (endothelial and myogenic) activity. Disease emerges when this balance is disrupted. Atherosclerosis is a major cause of microcirculatory damage and peripheral vascular disease. Nevertheless, microcirculatory dysfunction has been related with many other non-cardiovascular pathophysiological processes, including metabolic, neurodegenerative, and neoplastic processes, among others. Technology allowed dramatic advances in the non-invasive assessment of microcirculatory function. This progress is currently focused in preclinical imaging systems able to gather structure and function in vivo. Near-infrared spectroscopy (NIRS), positron emission tomography (PET), computed tomography (CT) and magnetic resonance imaging (MRI) are just a few examples of this new reality. In the present work we investigate a new multi-spectral optoacoustic tomography (MSOT) from iThera Medical (Muenchen, Germany) a last generation imaging instrument able to provide a wide resolution at 1.5 cm depth. Data was obtained in vivo from healthy participants, different ages recruited in our lab after informed written consent. All procedures were previously submitted to the institutional Ethical Commission. 3D videos are reconstructed and microvascular units analysed by Acuity software (iThera Medical). Real-time variables include Vascular density ( $\mu\text{Vu}$ ), inter unit average distance ( $\zeta\text{Ad}$ ), capillary blood volume ( $\text{mm}^3$ ), Maximal Oxygenated Haemoglobin ( $\text{Max HbO}_2$ ) and Deoxygenated Haemoglobin

(Max Hb). These instrument and parameters seem to offer new perspectives for microvascular translational imaging with a wide clinical potential.

ID: 5327

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual de Londrina (UEL-PR)

### NEONATAL OVERFEEDING-INDUCED OBESITY IMPAIRS EFFECTS OF EXOGENOUS CORTICOSTERONE ON ENERGY HOMEOSTASIS AND HYPOTHALAMIC-PITUITARY-ADRENAL AXIS

Reduction of the litter size in the first days of life is a neonatal programming model which results in higher body weight gain and adiposity of small litter animals, with higher concentration of circulating glucocorticoids. Obese rodents are more sensitive to the anabolic effects of glucocorticoids and less responsive to glucocorticoids feedback on hypothalamic-pituitary-adrenal (HPA) axis than lean animals. This work evaluated the effects of prolonged treatment (28 days) with Water or Corticosterone in adult (DPN 60) male Wistar rats of normal (NL- 10 pups) and small (SL- 3 pups) litter on energy homeostasis and HPA axis (CEUA number: 3457.2109.11, Of. Circ. CEUA 60/2019). In NL animals, glucocorticoid treatment caused ( $p < 0.05$ ) glucose intolerance, increased body weight, food intake, Lee index, plasma concentrations of total and LDL cholesterol. Litter size reduction induced ( $p < 0.05$ ) glucose intolerance, higher weight of perigonadal adipose tissue, plasma levels of triglycerides, free fatty acids, total and LDL cholesterol, with only minor metabolic effects in SL animals. On the other hand, glucocorticoid treatment reduced ( $p < 0.05$ ) corticosterone plasma levels and adrenal cortex only in NL group, associated with decreased ( $p < 0.05$ ) mRNA expression of corticotrophin-releasing hormone (CRH) in the hypothalamic paraventricular nucleus (PVN) and proopiomelanocortin (POMC) in the pituitary, without effects on SL animals. Reduction of the litter size induced hyperreactive of HPA axis, observed by high ( $p < 0.05$ ) mRNA expression of PVN CRH and pituitary POMC, corticosterone plasma levels, along with decreased mRNA expression of mineralocorticoid receptor in the PVN. Thus, neonatal overfeeding-induced obesity induces hyperreactivity of HPA, and reduces the responsiveness to glucocorticoids effects on energy balance and negative feedback of HPA axis.

ID: 5328

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de São Paulo (UNIFESP)

## **IMPACT OF FOOD IGG-BASED EXCLUSION AND PROBIOTICS SUPPLEMENTATION ON GASTROINTESTINAL AND PSYCHOLOGICAL SYMPTOMS OF UNIVERSITY STUDENTS DURING COVID-19 PANDEMIC CONFINEMENT**

University students were affected by COVID-19 pandemic and exposed to unhealthy eating habits and stress. Those factors distress intestinal microbiome and favor the development of intestinal and psychological symptoms. Our aim was to analyze the effect of probiotic and food exclusion based on IgG-mediated sensitization on gastrointestinal and psychological symptoms of university students during COVID-19 confinement. We assessed 34 students, self-declared stressed and with gastrointestinal symptoms. At the beginning (M1), blood was collected for the food hypersensitivity test (EUROLINE-108 IgG - EUROIMMUN). Volunteers were randomly assigned to: G1 (n=19): probiotics (*L. plantarium*; *L. rhamnosus*, *B. infantis*, 2 billion of colony-forming units of each strain, Terapêutica Farmácia de Manipulação, Brazil) or G2 (n=15): placebo, plus food hypersensitivity elimination diet (both groups). At M1, volunteers received a probiotic/placebo 3-month-treatment and completed electronic surveys: Gastrointestinal Symptom Rating Scale-GSRS and Hospital Anxiety and Depression Scale-HADS. At the fourth month, groups received personalized nutritional guidance for a 30-day-exclusion of positive IgG food and probiotics/placebo caps. At the end (M2), G1 and G2 answered the surveys. G1 and G2 presented a significant reduction in HADS, with no additional beneficial effect of probiotics. Gut symptoms were significantly lower in G1, without correlation with psychological parameters. Students in G1 that presented the highest number of hypersensitive foods exhibited the best increments in GSRS at M2. In addition, the GSRS deltas from M1 to M2 were different between groups. While the G2 had an average decrease of 3%, G1 presented a reduction of 19% in gastrointestinal symptoms ( $p=0.037$ ). Our study shows that although the use of probiotics plus food exclusion IgG-based did not affect psychological parameters of university students, it exerted a beneficial effect on intestinal symptoms.

ID: 5329

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

Autores: Jéssica Sá, Roberto Pontes, José Menani, Eduardo Colombari, Débora Colombari  
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## **ROLE OF THE RENIN ANGIOTENSIN SYSTEM AND SYMPATHETIC TONE IN CARDIOVASCULAR CHANGES IN WATER DEPRIVED HIGH-FAT FED RATS**

Water deprivation (WD) and obesity increase renin-angiotensin system and sympathetic nerve activity. Thus, WD, which is a common situation in nature, may induce greater cardiovascular responses in high-fat diet fed rats. Thus, the aim of this study was to verify the role of the renin angiotensin system and sympathetic tone in the maintenance of blood pressure during WD in HFD rats. Animals were fed with a SD (11% calories from fat) or with a HFD (45% calories from fat). After 6 weeks a cannula was inserted into the femoral artery and vein. The next day arterial pressure was recorded in euhydrated SD and HFD rats. Then the same rats were WD for 24 h and arterial pressure was recorded for a baseline period (20 min), followed by peripheral injection of losartan (10 mg/ kg, iv), and 15 min later an injection of hexamethonium (30 mg/kg, iv). HFD rats showed a higher mean arterial pressure (MAP) compared with SD rats before water deprivation ( $110 \pm 1.3$ , vs, SD:  $102 \pm 0.5$  mmHg,  $p < 0.05$ ) and after 24 h of water deprivation ( $117 \pm 2.6$ , vs. SD:  $107 \pm 2.2$  mmHg,  $p < 0.05$ ), although the increase in MAP was comparable between groups ( $\Delta$ HFD:  $7 \pm 2.5$ , vs.  $\Delta$ SD:  $5 \pm 1.6$  mmHg,  $p > 0.05$ ). Losartan injection decreased the MAP to the same extent in both groups ( $\Delta$ HFD:  $-14 \pm 1.5$ , vs.  $\Delta$ SD:  $-11 \pm 3.1$

mmHg,  $p > 0.05$ ) as well as hexamethonium ( $\Delta$ HFD:  $-68 \pm 2.6$ , vs.  $\Delta$ SD:  $-61 \pm 2.3$  mmHg,  $p > 0.05$ ). However, when analyzing the systolic blood pressure (SBP), there was a greater decrease in HFD rats after hexamethonium compared to SD rats ( $-81 \pm 2.7$ , vs. SD:  $-69 \pm 1.8$  mmHg,  $p < 0.05$ ). Therefore, the present data demonstrated that SD and HFD rats had a comparable increase in MAP during WD, however, the SBP data suggests that in HFD fed rats sympathetic tonus may have a greater role in maintaining arterial pressure at elevated levels during WD.

ID: 5333

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal do Pampa (UNIPAMPA)

### EFFECTS OF EGG WHITE HYDROLYSATE ON BLOOD PRESSURE AND AORTA VASCULAR RESPONSES IN HYPERTENSIVE DOCA-SALT RATS

Egg white hydrolysate (EWH) produced by hydrolysis with pepsin has biological properties attributed to bioactive peptides that could act on several cardiovascular diseases. We have tested the effects of egg white hydrolysate (EWH), with known antihypertensive properties, systolic blood pressure (SBP) and vascular effects in hypertensive DOCA-salt rats. Male Wistar rats (7 weeks; 220 g) were divided and treated for 8 weeks in: a) SHAM (unilateral uninephrectomy + distilled water via gavage); b) SHAM+EWH (unilateral uninephrectomy + HCO – 1kg/day via gavage); c) DOCA (unephrectomy unilateral + acetate and deoxycorticosterone (DOCA) (1st, 2nd-3rd and 4th-8th weeks: 20, 12 and 6 mg/kg respectively); d) DOCA+EWH (unilateral uninephrectomy + DOCA) and HCO – 1kg/day via gavage, 4th-8th weeks). DOCA and DOCA+EWH animals received daily as drinking water a solution of NaCl (1%) + KCl (0.2%) and the others animals only drink water. Blood pressure levels were measured by caudal plethysmograph. The aorta vascular reactivity was evaluated in an organ bath, endothelium and smooth muscle integrity were evaluated by concentration-response curves to acetylcholine (ACh). The results are expressed as mean and SEM, compared by ANOVA followed by the Bonferroni test with a significance level of  $p < 0.05$ . Hypertension produced by DOCA-salt model was significantly reduced by EWH-cotreatment (SHAM:  $116.5 \pm 1.5$ ; SHAM+HCO:  $118.9 \pm 0.7$ ; DOCA:  $194.9 \pm 3.7^*$ ; DOCA+HCO:  $153.9 \pm 5.1^{* \#}$  mmHg -  $^*$ vs SHAM  $\#$ vs DOCA). The endothelial dysfunction in the aorta of DOCA-salt rats was partially prevented by cotreatment of EWH ( $R_{max}$  – in % relaxation of pre-contraction Phe-3: SHAM:  $94.97 \pm 5.04$ ; SHAM+EWH:  $98.07 \pm 4.38$ , DOCA:  $40.84 \pm 5.14^*$ , DOCA+EWH:  $64.81 \pm 5.00^{* \#}$ ). EWH demonstrated antihypertensive power for the first time in the DOCA-salt rats' model and improves vascular relaxation of conductance artery, which may point to a possible therapeutic effect based on functional foods for hypertension.

ID: 5334

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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*Instituições: Universidade Estadual de Maringá (UEM-PR)*

### **CURCUMIN DOES NOT REVERSE PARACETAMOL-INDUCED HEPATIC LESION IN RATS**

Acetaminophen (paracetamol) is an analgesic and a nonsteroidal anti-inflammatory drug widely used for pain and fever reduction. Acetaminophen toxicity is one of the most common causes of liver transplantation worldwide. N-acetylcysteine (NAC) is used effectively as a specific antidote for acetaminophen poisoning. An excessive dosage of NAC over a short period can be toxic, leading to acute renal failure and finally to death. In this context, Curcumin, one of the components of *Curcuma longa* that has several therapeutic properties, especially anti-inflammatory, antioxidant and hepatoprotective activity, can be an alternative to NAC. This work aimed to evaluate curcumin effects in paracetamol-induced hepatic lesion in rats. Male Wistar rats with 60 days weighing 200 -250 g (CEUA/UEM 2226120619) received a single dose of paracetamol (2g.Kg<sup>-1</sup>) and after 1 h (NAC) (1.2 g.kg<sup>-1</sup>) or curcumin (500 mg.kg<sup>-1</sup>). After 48 h, plasma and liver were collected. AST, ALT; carbonylation levels; antioxidant capacity (TAC); thiols content and ferric reducing antioxidant power (FRAP) were evaluated in plasma. Liver was used to analyze oxidative stress: ROS, carbonylation, GSH, GSSG, SOD and catalase activity. The hepatic metabolism was measured by perfusion of fed rats. Data were analyzed by one-way ANOVA followed by Newman-Keuls post hoc test ( $p < 0.05$  denotes statistical). Paracetamol increased AST and ALT, NAC and curcumin were not able to reverse hepatic lesion. There was no significant difference between the groups in liver and plasma stress parameters, except the FRAP in plasma that increased 126% relative to controls, NAC prevented this increase by 57% and curcumin had no effect. Paracetamol impaired glycolysis and glycogenolysis and increased oxygen consumption and curcumin did not reverse these parameters. In conclusion, paracetamol provoked hepatic lesion that was not mediated by oxidative stress and curcumin was not able to mitigate the lesion.

*ID: 5335*

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Estadual Paulista (UNESP)*

### **OREXINERGIC SIGNALING IN THE PEDUNCULOPONTINE TEGMENTAL NUCLEUS DOES NOT PARTICIPATE IN THE HYPERCAPNIC VENTILATORY RESPONSE DURING THE DARK AND LIGHT PHASES OF THE DIURNAL CYCLE**

Orexinergic (OX) neurons in the lateral hypothalamus/perifornical area send their axons to respiratory network in the brainstem and the role of OX neurons on central chemosensitivity seems to be synchronized with the active - phase of the diurnal cycle. Cholinergic neurons located in the pedunclopontine tegmentum (PPT) are involved in modulation of respiratory responses to CO<sub>2</sub>. Since these neurons express OX receptors and receive direct projection of OX neurons, we tested the hypothesis that OX1Rs located in the PPT participate in the hypercapnic ventilatory response in a diurnal cycle-dependent manner. For this, we measured pulmonary ventilation (E) of unanesthetized male Wistar rats (250–320 g) using a whole-body plethysmograph system together with body temperature, EEG and EMG recordings, and analyzed the effects of microdialysis of an orexinergic 1 receptor antagonist (SB-334867; N-(2-Methyl-6- benzoxazolyl)-N'-1,5-naphthyridin-4-yl-urea - 5 mM] into the PPT on

ventilation in room air and in 7% CO<sub>2</sub> in the dark and light periods of the diurnal cycle. All procedures were approved by the Animal Care and Use Committee for the Institute of Biosciences at Botucatu - Brazil (CEUA – Vprotocol n°. 6766090620). Microdialysis of SB did not cause significant alterations in CO<sub>2</sub> ventilatory responses during wakefulness either in the dark (active) phase (E = 1866 ± 240 versus 1833 ± 113 mL kg<sup>-1</sup> min<sup>-1</sup>; n = 04) and in the light phase (E = 1853 ± 110 versus 1988 ± 199 mL kg<sup>-1</sup> min<sup>-1</sup>, n = 05). Our data suggest that orexinergic neurotransmission in PPT do not contribute to CO<sub>2</sub> ventilatory response in rats either in the dark-active phase or in the light phase of the diurnal cycle.

ID: 5338

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **EFFECT OF TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION ON AUTONOMIC CARDIOVASCULAR NERVOUS SYSTEM OF WOMEN WITH FIBROMYALGIA: A RANDOMIZED CONTROLLED TRIAL**

Fibromyalgia (FM) is characterized by the presence of chronic non-inflammatory muscular pain, hyperalgesia, and, allodynia. In addition, systemic disorders such as autonomic imbalances are associated with the syndrome. Seeking alternative treatments for dysautonomia, effects of electric currents have been tested in healthy populations. Literary findings are positive for transcutaneous electrical nerve stimulation (TENS), however, this effects on FM are unclear. The aim was to evaluate the effects of a single TENS application on the autonomic cardiovascular nervous system of women with fibromyalgia. Women with FM, 18 and 60 ages, sedentary and no severe hemodynamic disorders received TENS at the height of star ganglion, during 30 min, frequency of 80 Hz, pulse width of 150 µs and sensorial intensity. Volunteers were evaluated by infrared thermography, active orthostatic stress test (AOST), electrocardiography, systolic, diastolic, and, mean arterial pressure (SBP, DBP and MAP). Statistical analyzes were performed in GraphPad Prism® 8.0 software, with significance for values of  $p < 0.05$  and mean ± standard error of the mean. Normality was tested using the Shapiro-wilk. The analysis followed two-way ANOVA tests, with Tukey post hoc and unpaired student T test. A Z-score calculation was also made for the detection of outliers. There were no significant changes between the active TENS and TENS placebo, neither in relation to number of beats nor to the spectral analyzes. These findings suggest that high frequency TENS, applied in the region of the star ganglion, should not be used for modulation of sympatho-vagal activity. However, it does not offer acute adverse reactions to heart rate, ensuring its use for analgesic purposes in this population.

ID: 5339

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **SLEEP DISTURBANCES AND PSYCHOSOCIAL STRESS: AN AMBIGUOUS RELATIONSHIP IN PATIENTS WITH OROFACIAL PAIN**

Normal sleep is critical for well-being. Significant physiological and psychological distress is evoked by sleep disorders. Insomnia, co-exist frequently with orofacial region pain (ORFP) but the relation ORFP-insomnia-psychosocial factors has not yet been evaluated being the purpose of our study. Anonymized data from a ORFP patients (pts) self-report screening platform was used. Prevalence data for insomnia (ISI) stratified by severity grade and psychometric measures assessing dysmorphic concerns (DCQ), anxiety (GAD-7), illness perception (IPQ), injustice experience (IEQ), pain-related Catastrophizing (PCS), disability, depression (PHQ-9), and distress (PHQstr) were compared. Gender, age, employment status was analyzed as putative confounders. Mann-Whitney, KruskalWallis/Bonferroni and Spearman were used with  $p < 0.05$ . ORFP pts ( $n=184$ ; women:71%) of  $46 \pm 16$  years, had normal or pre-obese weight, most being light smokers and active workers, 35% reported insomnia and 16% of them experienced clinically relevant insomnia. Pain intensity, psychosocial burdens and sleep disturbances were higher in women. Severe depression, anxiety and distress were the most frequent symptoms and dysmorphic concern the least. DCQ, GAD-7, IPQ, PCS, PHQ-4, PHQ-9 scores had moderate to strong associations ( $r_s > 0.300$ ) with ISI ones. IEQ strongly correlated with ISI scores ( $-0.608 < r_s < 0.626$ ). Only pts unable to work had an association between PHQstr and ISI scores. Pts of [30-39] years had the greatest number of significant correlations, while the seniors ( $r_s > 70$  years) had none. Active workers had the highest number of associations between insomnia and impaired well-being followed by the retirees. Insomnia and psychosocial stressors ambiguously influence each other with different weights in ORFP. Due to the high incidence of clinically relevant insomnia, we recommend screening ORFP pts for insomnia and appropriate counselling. Our study shows the usefulness of a self-screening web-based platform for insomnia evaluation.

ID: 5341

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **ADDITIVE EFFECT OF HEAT STRESS ON HEMODYNAMIC RESPONSES TO HANDGRIP EXERCISE**

A heated environment (HOT) induces heat loss mechanisms (skin perfusion and sweating) and provokes venous pooling and peripheral vasodilation. The passive whole-body heating attenuate blood pressure (BP) and cardiac output (CO) responses to isometric handgrip exercise (HG). However, to date, there is no data of HG performed under a heated environment. This study aimed to investigate the additive effects of heat on BP responses and its determinants during static HG. Six healthy individuals (two women) participated in this study. The experimental protocol (ethics committee: 1.252.971) was performed in two environmental conditions randomized on the same day: Hot (HOT;  $\sim 37^\circ\text{C}$ ) and thermoneutral condition (TC;  $\sim 24^\circ\text{C}$ ). In both conditions, volunteers were exposed for 30 minutes at the supine position

before the beginning of the exercise protocol. The exercise intensity was fixed at 30% of the maximum voluntary contraction. BP, stroke volume (SV), heart rate (HR), and CO were continuously recorded. Total peripheral resistance (TPR) was calculated ( $TPR = MBP/CO$ ). The effects of the HOT ( $\Delta$ baseline HG HOT - TC) on the responses to HG ( $\Delta$ HG3min TC - baseline HG TC) and the additive effect of heat ( $\Delta$ HG3min HOT - baseline HG TC) were evaluated via oneway repeated measures ANOVA. HR increased in HG and HOT ( $\Delta 4 \pm 4$  vs.  $16 \pm 4$  bpm,  $p < 0.001$ ). The additive effect of heat was quantified by the greater SV decreased ( $\Delta -11.80 \pm 13.28$  vs.  $4.63 \pm 1.21$  mL,  $p = 0.02$ ) and the greater HR increased in the heat than in HG ( $\Delta 24 \pm 9$  vs.  $4 \pm 4$  bpm,  $p = 0.002$ ). In previous studies with whole-body heating, the reduction in stroke volume during HG may represent a shift in the operating point of the Frank-Starling mechanism to the steepest part of the curve due to the reduction in cardiac filling pressure. Therefore, despite of methodological approaches, VS decreases in the heat with a more pronounced decrease during exercise. HR increases in exercise and heat, with a more pronounced increase in heat.

ID: 5343

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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## EFFECTS OF PROTEIN RESTRICTION ON WHITE ADIPOSE TISSUE MORPHOLOGY AND FUNCTION

Nutritional deficiency in early life is related to physiological and metabolic disorders throughout life, contributing to the development of chronic diseases in adulthood. In this context, thyroid hormones exert pleiotropic actions, regulating energy metabolism and cell differentiation of various tissues. In adipose tissue (AT), these hormones regulate the expression of genes involved in lipogenesis, lipolysis, thermogenesis, and mitochondrial function. AT physiology is particularly important, as obesity is among the main risk factors for the development of chronic diseases. 30 days-old male C57Bl/6 mice were fed a normoprotein (14% protein, C) or hypoprotein (6% protein, isocaloric, R) diet during 14 weeks with free access to diet and drinking water (CEUA 5267-1/2019). Blood was collected for biochemical analysis, and the perigonadal adipose tissue (pgWAT) for histological analysis (hematoxylin-eosin staining) and protein content by Western Blot. Mice fed a protein-restricted diet showed higher insulin sensitivity, lower body weight, concentration serum albumin and total protein, characterizing malnutrition. Although they had higher energy expenditure, the R group presented increased pgWAT deposits weight and hypertrophied adipocytes. Also, R mice displayed a 37% increase in the protein content of glucose transporter type 4 and 38% in the beta subunit of the insulin receptor, and diminished activation of thyroid hormone signaling (decrease of 42% in the protein content of thyroid hormone receptor beta and 60% in deiodinase type 1). Together, our data show that post-weaning protein restriction leads to greater accumulation of pgWAT, which could be explained, in part, by increased insulin pathway signaling and reduced thyroid hormone signaling. An increase in adiposity is related to physiological abnormalities, which increase the risk of developing metabolic disorders, such as diabetes, cardiovascular diseases, and dyslipidemia.

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Área: Fisiologia do Exercício

*Forma de Apresentação: Ê-POSTER*

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### **PHYSIOLOGICAL EFFECTS OF UNILATERAL AND BILATERAL EXERCISE ON LOWER LIMB MICROCIRCULATION AND PLANTAR PRESSURE**

Unilateral exercise is a common practice in daily training. Here we compare the bilateral and the unilateral squat impact on the foot microcirculation and plantar pressure to better characterize related hemodynamics biomechanical adaptation. Eight healthy individuals ( $25.25 \pm 5.37$  y.o) were randomly assigned to 2 protocols with 3 phases - 1 (baseline, 5 minutes), 2 (exercise) and 3 (recovery, 5 minutes) in the standing position. Phase 2 included 2 minutes of exercise (protocol A unilateral squat, and protocol B bilateral squat). All procedures were previously approved by the institutional Ethics Committee (EC. ECTS/P03.20). Perfusion measurements were taken from both feet with Laser Doppler flowmetry (LDF) and polarized light spectroscopy (PS). Postural data were obtained with a FootScan® RsScan International® Balance pressure plate, which included the total pressure of each foot (N). A 95% CI was adopted. Results have shown that LDF detected a significant increase in both feet perfusion during phase 2 with both protocols (protocol A right foot with  $p=0.0021$  and left  $p=0.0001$ ; and protocol B right foot with  $p=0.0001$  and left  $p=0.0001$ ). Results from PS were also significant in phase 2 (protocol A right foot with  $p=0.0002$  and left  $p=0.0001$ ; and Protocol B right foot  $p=0.0001$  and left  $p=0.0001$ ). The left foot has shown higher pressure at the level of the hindfoot, while the right foot has shown higher support surface at the level of the forefoot, progressively transporting the foot to the midfoot. In protocol A, in phase 2, the highest plantar pressure zone remained the hindfoot. Perfusion differences seems to related with the individual laterality and posture which might help to better understand some asymmetries even in the absence of disease. Unilateral exercise can be used to better understand these adaptive mechanisms.

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*Área: Fisiologia do Exercício*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Federal do Piauí (UFPI)*

### **MODERATE PHYSICAL EXERCISE ACTIVATES ATR1A, ATR1B, AND ATR2 RECEPTORS, IMPROVING INFLAMMATION AND OXIDATIVE STRESS IN THE DUODENUM OF THE 2K1C HYPERTENSIVE RATS**

In addition to the cardiovascular system, the gastrointestinal tract also exhibits angiotensin AT1a, AT1b and AT2 receptors. Gastrointestinal disorders induced by 2K1C hypertension are prevented by physical exercise and inhibiting the renin-angiotensin system. Male Wistar rats weighing between 180-220g, 4 weeks age, ( $n = 5$  to  $9$ ) were used. All procedures were performed and approved by the Ethics Committee for Animal Use (CEUA) of the Federal University of Piauí, Brazil, (Protocol 518/18). In this study, we investigated the effect of physical exercise on inflammation, stress biomarkers, and of the angiotensin II receptors in the duodenum of 2K1C rats. Hypertension was induced through the (2K1C) model. The groups were: Sham, 2K1C and 2K1C+exercise. One week after the surgical procedures the

rats were submitted to physical exercise (running 5x/week, 60min/day). After 5 weeks we investigate the intestinal contractility, cytokines (TNF- $\alpha$ , IL-1 $\beta$ , IL-6) levels, oxidative stress (MPO, GSH, MDA, SOD) and angiotensin receptor gene expression (ATR1A, ATR1B, ATR2) in all groups. We observed a decrease ( $p < 0.05$ ) in intestinal contractility in the 2K1C hypertension group ( $p < 0.05$ ) compared to the sham group. 2K1C+Exercise group reduced MPO activity ( $p < 0.05$ ) compared to 2K1C ( $22.04 \pm 5.90$  vs.  $78.95 \pm 18.09$  UMPO/mg of tissue). In other, 2K1C+Exercise group increase ( $p < 0.05$ ) GSH concentrations vs. 2K1C group ( $67.63 \pm 7.85$  vs.  $31.85 \pm 5.90$  mgNPSH /mg tissue). The Exercise + 2K1C group showed a decrease ( $p < 0.05$ ) in cytokines levels compared to 2K1C group. The group of 2K1C+exercise induced a significant increase ( $p < 0.05$ ) in the gene expression of AT1bR and AT2R compared to the sham group. 2K1C hypertension induces intestinal inflammation and an oxidative stress process in the duodenum. Physical exercise modulates the AT1a, AT1b, and AT2 receptors suggesting that this activation can indicate a possible anti-inflammatory and antioxidant effect induced by exercise.

ID: 5347

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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#### INVOLVEMENT OF P2X7 AND AT1 RECEPTORS ON OXIDATIVE STRESS IN GASTROINTESTINAL TISSUE OF HYPERTENSIVE RATS SHR

The chronic inflammatory process is involved in the pathogenesis of Hypertension (H). There is an increase in reactive oxygen species, reduction in nitric oxide, endothelial damage, increased pressure, and organ damage. An important repercussion of hypertension is a change in gastrointestinal function such as dysbiosis and intestinal inflammation. Thus, the GI has been considered an important target in the treatment of this disease. The spontaneously hypertensive rat (SHR) animal model is used to reproduce human essential hypertension. We investigated the effect of the losartan (AT1 antagonist) and BBG (P2X7 antagonist) on oxidative stress in GI tissue in SHR rats. Male Wistar and SHR rats, 18 – 22 weeks, 150 to 180 g from the Bioterium of the State University of Piauí. The study was approved by the Ethics Committee on the Use of Animals at the Federal University of Piauí, number 627/20. Each group has an  $n = 8$ , divided into: Control, SHR, SHR + Losartan and SHR + BBG. The rats received losartan (10mg/Kg, i.p) or BBG (50mg/Kg, s.c) 30-min before the sacrifice. Next, the GI tissue (duodenum, ileum, colon, and myenteric plexus) was collected for the measurement of oxidative stress (MPO and GSH). In the colon, GSH activity ( $p < 0.05$ ) increased in the SHR+Losartan group compared to SHR ( $6.776 \pm 0.9156$  vs.  $2.884 \pm 0.7774$  mgGSH/g tissue). In the duodenum MPO ( $p < 0.05$ ) decreased in the SHR-Losartan group compared to the Control ( $0.8393 \pm 0.09679$  vs.  $0.3217 \pm 0.07610$  UMPO/mg tissue). In the myenteric plexus, the MPO also decreased ( $p < 0.05$ ) in the SHR-Losartan group compared to the SHR ( $0.4931 \pm 0.01999$  vs.  $0.1951 \pm 0.08683$  UMPO/mg tissue). Regarding treatment with BBG, a decrease in MPO activity was observed in the SHR-BBG group compared to SHR ( $0.3143 \pm 0.05624$  vs.  $0.1951 \pm 0.08683$  UMPO/mg tissue). It is suggested that an imbalance in the oxidant and antioxidant system is associated with hypertension and that acute treatment was effective in preventing oxidative stress.

ID: 5348

Área: *Fisiologia de Órgãos e Sistemas: Digestória*

Forma de Apresentação: *Ê-POSTER*

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### **INVOLVEMENT OF PHASE ANGLE VALUE AND BIOMARKERS OXIDATIVE STRESS IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE**

Phase angle (PhA) is one of the parameters for evaluating the nutritional status that reflects intra and extracellular water distribution, and reduced values are related to increased cell membrane permeability. This process can be related to oxidative stress, which favors the oxidation of biomolecules, as membrane lipids, being a characteristic disorder of inflammatory bowel diseases (IBD). In this study, we first investigate the relationship of PhA with oxidative stress in patients with IBD. Study enrolling patients with IBD (n=31) and control group (without disease, n=21), aged between 20 to 60 years. Nutritional status was evaluated through bioimpedance. We also investigate levels of oxidative stress in plasma: Nitrite (Nox), myeloperoxidase (MPO), glutathione (GSH), malondialdehyde (MDA) and superoxide dismutase (SOD). All procedures were performed and approved by the Research Ethics Committee (CEP) of Federal University of Piauí, Brazil, (Protocol n.4.276.832). For comparisons between groups, we used Kolmogorov-Smirnov test followed by student's t test or Mann-Whitney. Linear regression was used to correlate the variables. We have not observed a difference in PhA (IBD:6.85±0.28 vs. Control:6.72±0.24°). Compared with the control group, the IBD group has increased (p<0.05) concentrations of Nox (IBD:34.50±6.1 vs. Control:19.95±1.5µM), MDA (IBD:5.29±0.7 vs. Control:0.70±0.3nmol/µL) and activity of MPO (IBD:2.37±0.6 vs. Control:1.09±0.4U/µL). On other hand, compared the control group, IDB group decreased (p<0.05) activity of SOD (IBD:1.46±0.1 vs. Control:1.82±0.1U) and no change in GSH. MDA was negatively correlated with PhA (R<sup>2</sup>:0.37; p:0.004); and SOD was positively correlated with PhA (R<sup>2</sup>:0.36; p:0.004) in patients with IBD, but not in control group. IBD induces oxidative stress and some biomarkers were related to increased cell permeability measured by PhA. Thus, we suggest that PhA values are related to oxidative stress in patients with IBD.

ID: 5349

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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*Instituições: Universidade Estadual de Londrina (UEL-PR)*

### **HERBICIDES AND PROTECTIVE EFFECT OF IRON OXIDE NANOPARTICLES: PLASMA CONCENTRATIONS OF LIVER ENZYMES, CREATININE, AND IRON**

Roundup® (active ingredient: glyphosate) and Atrazine are widely used in crops despite their toxicity,

and iron oxide nanoparticles (eg ferrihydrite) can adsorb these herbicides. Thus, this work evaluated if ferrihydrite protects against Roundup®, glyphosate, and Atrazine and if the ferrihydrite itself is toxic. Male (m; n=40) and female (f; n=40) Wistar rats (90 days) were distributed into 8 groups/gender (5 rats/group). The groups received 4 doses (1/day; 1000 mg/kg of each component, via gavage) of ferrihydrite (F), glyphosate (G), Roundup® (R), or Atrazine (A), or the association FG, FR, or FA, and water as control (C). Euthanasia was performed 24 h after the last gavage and blood was collected for plasma AST, ALT, creatinine, alkaline phosphatase, and iron dosages. The data were expressed as mean±SEM and two-way ANOVA followed by SNK post-test ( $p<0.05$ ) was used. This work was approved by CEUA (n° 30861.2014.66). Creatinine and ALT did not change in the groups, as well as G did not promote any change. Reduced plasmatic concentration of alkaline phosphatase (U/L) in the groups Af ( $33.2\pm 3.9$ ;  $p<0.05$ ) and Am ( $50.8\pm 3.1$ ;  $p<0.05$ ) compared to control groups (Cf:  $44.9\pm 2.6$ ; Cm:  $63.8\pm 7.8$ ; respectively) was found and the FA association did not prevent this response (f:  $23.9\pm 3.4$ ; m:  $41.3\pm 7.9$ ). In females, plasmatic iron (mg/L) was increased in the group F ( $8.9\pm 1.2$ ;  $p<0.05$ ) and reduced in group A ( $1.7\pm 0.1$ ;  $p<0.05$ ) and the association did not prevent this response (FA:  $1.9\pm 0.1$ ) compared to group C ( $2.9\pm 0.3$ ). In males, the increase in AST (U/L) in group A ( $77.9\pm 11.7$ ;  $p<0.05$ ) was suppressed in FA ( $43.1\pm 2.8$ ; group C:  $47.7\pm 3.2$ ). R caused 100% of mortality in females and 80% in males; the FR association did not reduce this percentage in males (80%), but in females, the mortality was zero (0%). Thus, ferrihydrite, despite changing some parameters, was effective in reversing the increase in AST in males and avoiding the high mortality induced by Roundup® in female rats.

ID: 5351

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### **VASOPRESSIN SECRETION IS MODULATED BY ESTROGEN LEVELS IN FEMALE RATS: THE ROLE OF ESTROGEN RECEPTOR BETA**

The hypothalamic magnocellular neurons (MCNs) produce and secrete vasopressin (AVP) in response to hyperosmolality. In the circulation, AVP act to increase renal water reabsorption and blood pressure. Recent studies show that the estrogen receptor of type  $\beta$  (ER $\beta$ ) increases the sensitivity of MCNs to hyperosmolality-induced AVP secretion. This work aims to evaluate the sex dimorphism and the role of estradiol (E2) on AVP synthesis-activity-secretion coupling in response to acute hyperosmolality. For that, we used Wistar males, intact females at proestrus/estrus (P/E), intact females at metaestrus/diestrus (M/D), ovariectomized (OVX) females treated with oil, and OVX females treated with E2 (10  $\mu$ g per rat) rats. Animals were euthanized 30 min after hypertonic (1.5 M NaCl) or isotonic (0.15 M NaCl) solutions administration for blood collection. As expected, the hypertonic solution administration increases the plasma AVP levels, osmolarity, and Na<sup>+</sup> concentration ( $p < 0.0001$ ). However, after hypertonic stimulus, females in M/D and OVX+Oil showed lower plasma AVP levels than males, females in P/E, and OVX + E2 (all  $p$ 's  $< 0.001$ ). Thus, high E2 levels seem to be necessary for female rats to achieve a full hyperosmolality-induced AVP secretion. The E2 modulation on AVP levels could be related to the ER $\beta$  activation due to its effect on MCNs. To understand the role of ER $\beta$  on MCNs in response to acute hyperosmolality, we are evaluating the effects of specific ER $\beta$  agonist (DPN; 300  $\mu$ g.kg<sup>-1</sup>) and antagonist (PHTPP; 600  $\mu$ g.kg<sup>-1</sup>.) on the supraoptic nucleus (SON) gene expression. So far, our data demonstrate a clear effect of E2 in increase uterine and adenohipophysis indexes in comparison with OVX+Oil animals ( $p < 0.01$ ). With the brain samples collected, we will next evaluate the role of ER $\beta$  on MCNs gene expression and neuronal activation in the SON. We expect to demonstrate the key molecular pathway by which estrogen/ER $\beta$  signaling can modulate AVP synthesis and secretion by the MCNs.

ID: 5352

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

Autores: Daniela Vanessa de Siqueira, Ricardo Mauricio Leão

Instituições: Universidade de São Paulo (USP)

### **SALICYLATE OPENS KATP CHANNELS AND INHIBITS SPONTANEOUS FIRING IN AN INHIBITORY INTERNEURON IN THE AUDITORY BRAINSTEM**

Hyperactivity of The Dorsal Cochlear Nucleus (DCN) is critical to the development of tinnitus. The cartwheel (CW) neurons are glycinergic interneurons that present spontaneous firing and produces a strong tonic inhibition in DCN neurons. Salicylate in high concentrations induces tinnitus in humans and rodents and when incubated in brainstem slices containing the DCN, inhibits the spontaneous

firing in CW neurons. Recent data from our laboratory demonstrated that open ATP-sensitive potassium channels (KATP) are responsible for the existence of a small fraction of silent (not firing spontaneously) CW neurons. Salicylate in high concentrations is a mitochondrial uncoupler and reduced ATP can open KATP channels. Here we investigated if salicylate is acting on CW neurons by open KATP channels, using whole-cell recordings from CW neurons in slices from rats 17-22 days old (CEUA 7/2021). Application of salicylate (1.4 mM) hyperpolarized the membrane of CW neurons from  $-77 \pm 1$  mV to  $-83 \pm 1$  mV ( $n=21$ ,  $p=0.003$ ) decreasing membrane resistance from  $216 \pm 15$  M $\Omega$  to  $152 \pm 11$  M $\Omega$  ( $p=0.007$ ), stopping spontaneous firing, suggesting hyperpolarization by opening a potassium conductance). Analysis of the current-voltage (IV) relationship showed that salicylate produces an outward current above the reversal potential of potassium. KATP channel activator diazoxide also hyperpolarizes the membrane and induces a similar current in CW neurons. In the presence of diazoxide, salicylate does not hyperpolarize the membrane ( $-83.5 \pm 2$  mV to  $-79.8 \pm 3$  mV;  $n=8$ ;  $p=0.2$ ) and does not change membrane resistance ( $140 \pm 9$  M $\Omega$  to  $170 \pm 20$  M $\Omega$ ;  $p=0.1$ ). Also, salicylate after diazoxide does not induce any change in the IV relationship of CW neurons. We conclude that salicylate is activating KATP channels and reducing spontaneous firing of CW neurons, reducing the glycinergic inhibition on fusiform neurons, and could be a possible mechanism of salicylate induced tinnitus.

ID: 5353

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## SENSITIZATION OF SODIUM INTAKE AND PREFERENCE FOR CAPSAICIN

It is suspected that the aversion produced by the salty taste of hypertonic NaCl is a consequence of the activation of oral nociceptors. In this work, we investigated whether sensitization of 0.3M NaCl intake alters the preference for capsaicin, a vanilloid that activates oral nociceptors. Adult male rats with free access to standard chow and two drinking bottles, one containing 0.3 M NaCl and the other water, were sodium depleted three times once a week (sensitized,  $n = 6$ ), or only received sc injection of vehicle (control,  $n = 6$ ). Each sodium depletion (sc injection of furosemide + 24 h of ambient sodium removal) was followed by a return to 0.3 M NaCl and standard chow. One week after the last sodium depletion, the bottle containing 0.3 M NaCl was replaced, on the first occasion, by a bottle containing capsaicin, which was offered according to a protocol of ascending concentration renewed every 48 hours. Then, the bottle containing 0.3 M NaCl was returned to the animals for one week, with access to capsaicin removed. Then, capsaicin replaced 0.3 M NaCl on a second occasion, as per the ascending concentration protocol. The preference for capsaicin was determined in % from the ratio between daily average total fluid intake and daily average capsaicin intake. There was no difference between sensitized and control on the first occasion of access to 0.5, 4 and 12  $\mu$ M capsaicin (mean preference around 20, 4 and 1%, respectively). On the second occasion, the preference for 0.5  $\mu$ M capsaicin increased in the sensitized group compared to the control ( $42 \pm 12$  vs.  $10 \pm 5\%$ ;  $p < 0.05$ ), and remained the same in both groups in the other concentrations. The results suggest that sensitization of sodium intake affects capsaicin preference.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **THE USE OF THERMOGRAPHY FOR STRESS ASSESSMENT: A LITERATURE REVIEW**

Considering that psychological stress can cause changes in skin blood flow, thermography has been increasingly studied as a method to measure the stress experienced by individuals (Physiol. M. 3:40, 2019). In the teaching context, overwork and lack of time, challenges faced by students, corroborates the emergence of negative emotions such as stress and anxiety, so stress measurement strategies in teaching-learning situations could be a useful tool. Based on this, this study aimed to identify thermography use protocols for stress assessment, highlighting similarities and differences. This review runs with the keywords "thermography and stress" on PubMed platforms; Scielo and WorldWideScience. Articles published between 2010 and 2020 were selected, made with human beings, excluding external factors that can trigger stress, such as cold and heat. 88 results were found, of which 4 met the criteria. Considering the results, it is concluded that all studies performed pre and post tests to assess the change in skin temperature as a way to measure stress. However, only one study was not carried out in an air-conditioned and controlled environment (Physiol Meas. 40:3,2019). In addition, most subjects used in the studies are male. Furthermore, only one article evaluated the temperature of specific regions of the body such as the nose and hands (In. Psychophysio. 15:234,2017). Therefore, it can be said that studies that evaluated stress through pre- and post-tests, and were carried out in controlled environments, demonstrated that thermography is a very promising diagnostic tool in the assessment of stress in human beings.

ID: 5357

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **NADPH OXIDASE CONTRIBUTES TO GLIAL CHANGES IN MEDULLARY RESPIRATORY NEURONS IN AN ANIMAL MODEL OF PARKINSON'S DISEASE**

Parkinson's disease (PD) is a neurodegenerative disease characterized by the loss of dopaminergic neurons in the Substantia Nigra (SN). There are several motor and non-motor symptoms, such as respiratory problems. In a toxin model of PD induced by 6-hydroxydopamine (6-OHDA), the SN and respiratory column (RC) neurodegeneration, causing respiratory dysfunction is related to oxidative stress (OS) which may be due to increased enzymatic activity of NADPH oxidase (NOX). We evaluated whether NOX non-specific inhibitor, apocynin (APO), could prevent glial changes in RC in 6-OHDA animals. Wistar male rats were set up in 4 experimental groups: I) Vehicle, II) 6-OHDA, III) Vehicle + APO and IV) 6-OHDA + APO (CEUA n°2740200319). Vehicle or 6-OHDA (24 µg/µl) were injected bilaterally

into the striatum to induce the PD model. At 20 days after surgery, treatment with APO (50 mg/ml/kg at drinking water) was done for 20 days. After that, immunohistochemistry was performed for Tyrosine Hydroxylase (TH) to evaluate SN, and Iba1 and GFAP to evaluate microglia and astrocytes within the RC, respectively. 6-OHDA reduced >70% of TH+ neurons in SN and APO did not reverse it ( $p=0.0001$ ). In the RC, we observed changes in microglia skeleton analysis in 6-OHDA that was prevented with APO treatment (Endpoints: caudal Nucleus of Solitary Tract (cNTS) ( $p=0.0008$ ), intermediate NTS ( $p<0.0001$ ), Retrotrapezoid Nucleus (RTN) ( $p=0.0094$ ); Branches: NTSc ( $p=0.0004$ ), NTSi ( $p<0.0001$ ), RTN ( $p=0.0177$ ); Total cell: Pre-Bötzinger Complex (preBötC) ( $p=0.0356$ ) and rostral ventral respiratory group (rVRG) ( $p=0.0223$ ). Astrocytes analysis showed a GFAP density reduction in RC in 6-OHDA, prevented after APO treatment (NTSc:  $p<0.0001$ , NTSi:  $p<0.0001$ , RTN:  $p<0.0001$ , rVRG:  $p<0.0001$ , preBötC:  $p<0.0001$ ). We concluded that NOX may be responsible for OS in RC causing changes in glial cells that contribute to respiratory deficits in PD animal model.

ID: 5358

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **AUGMENTED CARDIAC SYMPATHETIC MODULATION WITH COMBINED HEAT AND GRAVITATIONAL STIMULUS IN HEALTHY INDIVIDUALS**

Heat stress shifts blood to the skin, decreasing venous return to the heart and challenging cardiovascular control. As a compensatory response, an augmented sympathetic discharge to the heart increases heart rate (HR). Additionally, a gravitational stimulus, such as orthostatic stress, induces similar cardiovascular responses. Since both thermal and gravitational stimulus changes cardiovascular modulation, we investigated the interplay between heat and postural stress on heart rate variability (HRV). Sixteen healthy individuals ( $27 \pm 5$  yrs) performed two active standing tests (ORT) under a hot (HOT;  $\sim 36^\circ\text{C}$ ) and a thermoneutral (TC;  $\sim 24^\circ\text{C}$ ) conditions, randomized at the same day (CEP:1.252.971/2015). R-R intervals, and skin temperature ( $T_{\text{skin}}$ ) were continuously recorded during supine (SUP; 30min) and orthostatic (ORT; 6min) positions. Spectral analysis was performed to identify low (LF) and high frequency (HF) components of R-R, and sympatho-vagal balance was calculated (LF/HF). Non-linear symbolic analysis classified R-R variations into 2 patterns: no variation (0V; sympathetic modulation) and 2 variations (2UV; vagal modulation). Paired t-test was used for  $T_{\text{skin}}$  and postural changes ( $\Delta = \text{ORT} - \text{SUP}$ ) comparisons between thermal conditions.  $T_{\text{skin}}$  (HOT  $36.9 \pm 0.6$  vs. TC  $35.4 \pm 0.9$  °C),  $\Delta\text{HR}$  (HOT  $32.3 \pm 12.4$  vs. TC  $18.6 \pm 9.3$  bpm),  $\Delta\text{LF}/\text{HF}$  (HOT  $28.3 \pm 25.5$  vs. TC  $9.5 \pm 8.3$ ) and  $\Delta 0\text{V}$  (HOT  $31.0 \pm 15.0$  vs. TC  $22.5 \pm 13.8$  %) increased in HOT compared to TC ( $p<0.01$ ). Since both thermal and gravitational stimulus augments sympathetic drive to the heart, we found a combined effect of HOT and ORT on the heart rate increase. Therefore, augmented cardiac sympathetic modulation, showed by both linear and non-linear HRV methods, was determinant in HR increase under heat stress.

ID: 5359

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### EFFECTS OF FLUID STRATEGY AT HIGHER AND LOWER PEEP ON LUNG DAMAGE IN EXPERIMENTAL ACUTE RESPIRATORY DISTRESS SYNDROME

The optimal positive end-expiratory pressure (PEEP) for patients with the acute respiratory distress syndrome (ARDS) is not known and there is conflicting evidence in the literature regarding the relationship between PEEP and fluid strategy. PEEP potentially recruits alveoli and improves functional residual capacity; however, the increase in alveolar pressure due to PEEP may increase right atrial pressure, which could decrease venous return. The present study (CEUA 101/18) compared the impact of low and high fluid administrations at two different PEEP levels on cardiac and respiratory function and lung and kidney molecular biology. ARDS was induced in 30 male Wistar rats (335±31g) through intratracheal instillation of *Escherichia coli* lipopolysaccharide (9.6×10<sup>6</sup> EU/mL). After 24-h, animals were anesthetized, protectively ventilated (VT=6 mL/kg) and randomized to LOW (5 mL/kg/h) or HIGH (20 mL/kg/h) fluid strategy (Ringer lactate). Both groups were then exposed to low PEEP (3 cmH<sub>2</sub>O, PEEP3) and high PEEP (9 cmH<sub>2</sub>O, PEEP9) for 1-h (n=6/group). Echocardiography, arterial blood gases and respiratory mechanics were evaluated throughout the experiment. Lung was removed for histological analysis. PAT/PET was lower in LOW-PEEP9 than LOW-PEEP3 (0.282±0.040 vs 0.494±0.063, p<0.05), suggesting high right ventricular load. In animals ventilated with PEEP 9, lung mechanical power (MP,L) and plateau pressure (Pplat,L) were higher in PEEP 9 compared to PEEP3 within the same fluid status. Heterogeneity index was higher in both LOW and HIGH at PEEP9 (1.44±0.11 and 1.61±0.17, respectively) when compared to LOW and HIGH at PEEP3 (1.21±0.02 and 1.19±0.12, respectively). Perivascular edema was higher in both groups at HIGH fluids when compared with both groups at LOW fluids. In this model of ARDS, high PEEP levels at high fluid status promoted high alveolar heterogeneity and perivascular edema.

ID: 5360

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### ROLE OF THE PARAVENTRICULAR NUCLEUS OF THE HYPOTHALAMUS FOR THE MAINTENANCE OF SYMPATHETIC ACTIVITY AND ARTERIAL PRESSURE IN RATS WITH HIGH SALT INTAKE

High sodium intake can affect the excitability of neurons in regions involved in the control of sympathetic activity. The neuronal activity of the hypothalamic paraventricular nucleus (PVN) increases in several

models of sodium-sensitive hypertension. However, the mechanisms by which sodium increases mean arterial pressure (MAP) are still not completely clear. Here, we investigated the importance of PVN for the increase in sympathetic nerve activity (SNA) and MAP during high salt intake. In addition, fluid intake and urine excretion were also analyzed during high salt intake. Male Wistar and Holtzman rats (n=3-5/group) had access to water (control, CTR) or 2% NaCl (salt loading, SL) to ingest for 7 days. Then, they were anesthetized ( $\alpha$ -chloralose/urethane) and prepared to record renal and splanchnic SNA and MAP while they received bilateral injections of vehicle (PBS) or muscimol (GABAA receptor agonist, 1 nmol/50 nL) into the PVN. Separate groups of CTR and SL rats were individually housed in metabolic cages to measure daily fluid intake and urine excretion. Muscimol into the PVN caused greater reductions of renal and splanchnic SNA in SL than in CTR rats (CTR:  $-13.7 \pm 1.9$  and  $-17.8 \pm 1.9$ , vs. SL:  $-30.5 \pm 4.9$  and  $-32.9 \pm 3.6$   $\Delta\%$ , respectively) and MAP (CTR:  $-14 \pm 2$  vs. SL:  $-25 \pm 3$  mmHg), ( $p < 0.05$ ). SL rats ingested more fluid than CTR rats (CTR:  $42.2 \pm 0.8$  ml of water; vs. SL:  $111 \pm 20.8$  ml of 2% NaCl at the 7th day) with significant increase in urine excretion (CTR:  $5.7 \pm 1.3$ , vs. SL:  $80 \pm 21.6$  ml at the 7th day), ( $p < 0.05$ ). These findings suggest tonic control of PVN on sympathetic activity and arterial pressure in SL treated rats. They also confirm increased daily NaCl drinking and urine excretion in SL treated rats. Future studies include the glutamatergic neurotransmission investigation and the mechanisms with one's high salt intake might contribute to PVN neuroinflammation to tonically modulate the SNA and MAP as observed in this experimental model.

ID: 5361

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## EVALUATION OF THE INFLUENCE OF ESTRADIOL ON IMMUNE RESPONSE MECHANISMS IN MONOCYTES/MACROPHAGES INDUCED BY GARDNERELLA VAGINALIS

*Gardnerella vaginalis* is a commensal bacterium of the vaginal microbiota. These bacteria are the main agent of bacterial vaginosis (BV). BV is not well understood as an infection mainly affecting fertile women, hypothesizing the influence of sex hormones. The aim of this study was to evaluate the influence of  $17\beta$ -Estradiol (E2) on the host response mechanism to *G. vaginalis* infection. An in vitro model using peritoneal macrophages from Balb/C Shams or Ovariectomized (OVX) females was performed. Cells were inoculated with *G. vaginalis* or sterile saline for 6 hours. OVX cells also were pre-treated with E2 prior to stimulation. Cytokines, total nitrites and hydrogen peroxide were measured in the culture supernatant. Gene expression of TLR-2, NF- $\kappa$ B, ER $\alpha$  and ER $\beta$  also performed. In addition, a growth curve was performed with *G. vaginalis* and the  $17\beta$ -Estradiol response over a 24-hour period. For the analysis of the growth curve, the inhibitory activity of E2 on *G. vaginalis* can be verified. SHAM females had higher uterine weight, while OVX had higher body weight. All inflammatory markers showed high levels in infected cells when compared to the non-infected cells. Comparisons between infected cells from the Sham, OVX and OVX treated with E2 showed higher levels of all inflammatory markers on cells from the Sham model, except for the expression of ER $\beta$ . The influence of  $17\beta$ -estradiol on the immune system can be observed, delineating immunomodulatory characteristics to the infection by *G. vaginalis*, as well as the bacteriostatic influence of this microorganism.

ID: 5362

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **DIABETES MELLITUS AS A RISK FACTOR FOR CARDIOVASCULAR OUTCOMES IN HOMELESS PEOPLE IN THE CENTRAL REGION OF SÃO PAULO**

**INTRODUCTION:** Diabetes mellitus (DM) is a risk factor (RF) for cardiovascular diseases (CVD) and is characterized by inability to produce and/or action of insulin and consequent persistent hyperglycemia, which determines microvascular and macrovascular complications. In the homeless population, the risks for cardiovascular outcomes associated with DM are higher, mainly due to the situation of social vulnerability in which they find themselves. **OBJECTIVE:** To describe the relationship between DM and the risks for cardiovascular outcomes in this public. **METHODOLOGY:** This is an exploratory, cross-sectional, quantitative field study conducted in downtown São Paulo from November 2019 to March 2020. A previously structured questionnaire was applied and approved by the institutional Ethics Committee under protocol: 036417, CAAE: 21519413.4.0000.5511. There were 173 volunteers selected by convenience, where the sociodemographic profile was characterized, the presence of RF for CVD was verified, and blood pressure (BP) and heart rate (HR) were measured. **RESULTS AND DISCUSSION:** When the interviewees were asked which RF for CVD they knew, 76% could not inform. The mean BP was 143x95 mmHg and HR of 90bpm. 56% of them do not practice physical activity (sedentary). 37% have lived on the street for more than five years, which configures a greater exposure to RF for DM, increasing the risks for CVD, because hyperglycemia increases plasma osmolarity, causes endothelial dysfunction, and accelerates the process of vascular calcification. **CONCLUSION:** It was observed that there is a great exposure of the studied population to several triggering factors of DM, thus making them more susceptible to the development of CVD. Moreover, it was evidenced that there is a lack of knowledge by the interviewees about the RF for CVD and this may favor the increased risk of developing these diseases. Health education was performed as a nursing intervention against the problem.

ID: 5363

Área: Fisiologia Comparada

Forma de Apresentação: Ê-POSTER

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### **MEASUREMENT OF THE BODY COMPOSITION OF TEGU LIZARDS (SALVATOR MERIANAE) USING A NON-INVASIVE METHODOLOGY**

Seasonal and daily fluctuations in body composition are commonly observed in some species. It is assumed that the body condition, especially the amount of energy reserve (fat deposits), influences the survival, growth, activity and even the reproductive success of the animal. Tegú lizards (*Salvator*

merianae) show significant reproductive investment in spring, preceded by metabolic and activity reduction during winter hibernation and followed by high summer activity that must be accompanied by important changes in body composition. Non-invasive techniques for measuring body composition are critical for longitudinal studies of life history, in addition to the link between body condition and physiology, and can be properly applied in this case of tegus. Dual Energy X-ray Absorptiometry (DEXA) is a non-invasive technique of measurements based on the molecular tissue level in a simplified 3-compartment model: bone mineral content (BMC), lean mass (ML) and fat mass (FM). It is widely used to determine the body composition of human beings, other mammals and birds, but its use in lizards is little known, and validation is needed. Therefore, we aimed to validate the use of this technique to measure body composition of tegus. Data collected using DEXA were compared with values for ash mass (AM), crude protein (CP), fat (FM) and total body water (TBW), observed in the chemical analyzes of the carcasses of 4 subjects. Equation models were generated to predict each body component. Our results show a strong correlation between DEXA values and chemical analysis for AM ( $r = 0.93$ ), CP ( $r = 0.99$ ), FM ( $r = 0.92$ ) and TBW ( $r = 0.96$ ). Paired t-test showed no significant differences between the means observed in the chemical analysis with the means obtained by the equation ( $p = 0.99$  for all components). Thus, DEXA which has already been shown to be accurate in other species, is an interesting tool for using in longitudinal studies these lizards.

ID: 5364

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## **DISTRIBUTION AND MORPHOLOGY OF CHOLINE ACETYLTRANSFERASE (CHAT) IN MARMOSSET STRIATUM (CALLITHRIX JACCHUS)**

The striatum is the main integrative component of the basal ganglia and plays a crucial role in controlling motor activities, cognition, working memory and reward behaviors. The main neurons in the striatum are medium spiny neurons, whose activity is regulated by several factors. In this study, we describe the distribution and morphology of choline acetyltransferase (ChAT) in the striatum of marmosets. The marmosets were deeply anesthetized and perfused. After performing the microtomy, the samples were immunostained with choline acetyltransferase (ChAT,  $n = 2$ ). After staining, photomicrographs were taken at different magnifications of slices along the entire rostrocaudal extension of the striatum to illustrate the distribution patterns of the various types of immunostaining, as well as the morphological characteristics of immunostained neurons, neuropils, and fibers. ChAT-positive tissue follows an increasing mediolateral gradient at the rostral levels of the striatum, becoming homogeneously moderate at the middle and caudal levels. There was no distinction between matrix and striosome, detectable by histochemical techniques for acetylcholinesterase (AChE). This study was carried out in accordance with the recommendations of the UFRN Animal Experimentation Ethics Committee (004/2009; 043/2012), which approved the experiment. ChAT + immunoreactive cells were located in a relatively sparse distribution throughout the striatum. Most striatal cholinergic neurons had large soma (mean diameter:  $22.223 \pm 3.42 \mu\text{m}$ ,  $n = 300$ ), spherical, polygonal or multipolar, from which two to five primary dendrites emerge. Knowing the distribution patterns of different neurotransmitters and modulators, as well as the characteristics of different cell subpopulations of the striatum, can be an important target for research aimed at developing new therapeutic strategies for these diseases.

ID: 5365

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **MODULATION OF INFLAMMATORY CYTOKINE IN THE GASTROCNEMIUS MUSCLE IN RESPONSE TO PREVENTIVE AND THERAPEUTIC TRAINING IN AGING AND DIETINDUCED OBESE RATS**

Physical exercise has many benefits, such as reducing inflammation and its consequent damage. This study aimed to evaluate the preventive and therapeutic effects of training on production of inflammatory cytokines in aged and dietinduced obese rats. For this, 32 male Wistar rats (300-350g), initial age=4 months, final age=14 months, were distributed into four groups (8/group): aged sedentary (AS), aged sedentary obese (ASO), aged therapeutically trained obese (ATO) and aged preventively trained obese (APO). Training was performed on a treadmill, at moderate intensity, alternated days for 60 minutes/session. The gastrocnemius muscles were collected, weighed and the cytokines TNF- $\alpha$ , IL-1 $\beta$ , IL-6 and IL-10 were measured in the muscle. The study was approved by the CEUA of the IMSUFBA (Protocol: 079/2020). Comparisons between AS and ASO groups were made using Student's t test. Analyzes between ASO and trained groups were performed using One-Way ANOVA. Differences were considered significant when  $p < 0.05$ . ASO, compared to AS, showed decreased gastrocnemius weight ( $0.47 \pm 0.03$  vs  $0.58 \pm 0.03$ ), increased IL-6 ( $52.64 \pm 3.27$  vs  $38.73 \pm 3.09$ ), IL-1 $\beta$  ( $60.83 \pm 2.62$  vs  $30.11 \pm 2.85$ ) and TNF- $\alpha$  ( $94.91 \pm 2.44$  vs  $76.21 \pm 3.16$ ), and a reduction in IL-10 ( $26.80 \pm 2.54$  vs  $32.88 \pm 2.76$ ). Compared to ASO, both trainings determined a decrease in TNF- $\alpha$  (APO= $86.30 \pm 2.83$ ; ATO= $88.67 \pm 4.294$  vs  $94.91 \pm 2.44$ ), increase in muscle weight (APO= $0.60 \pm 0.029$ ; ATO= $0.56 \pm 0.042$  vs  $0.47 \pm 0.03$ ) and IL-10 (APO= $60.98 \pm 5.18$ ; ATO= $38.52 \pm 3.94$  vs  $26.80 \pm 2.54$ ). Compared to ASO, only APO decreased IL-1 $\beta$  ( $50.43 \pm 2.84$  vs  $60.83 \pm 2.62$ ), and increased IL-6 ( $65.19 \pm 4.46$  vs  $52.64 \pm 3.27$ ). Thus, obesity determined muscle mass loss possibly associated with increased muscle pro-inflammatory status. Both trainings recovered muscle mass and improved the inflammatory profile. However, the best effects were observed in the preventively trained group.

ID: 5367

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **AGING POTENTIALIZE HIPERCOLESTEROLEMIA BUT DOES NOT FAT ACCUMULATION IN DIET INDUCED OBESE ANIMALS**

The world population is aging, there is a decreasing trend in natality and augmented life expectancy. Aging

increases the susceptibility and prevalence for non-communicable diseases, such as cardiovascular disease, diabetes and cancer, which is the main cause of the death in the world. Regarding aging, our work focused in looking for the physiological alterations in the lipid metabolism lead by aging in diet induced obesity animals. Therefore, we have hypothesized that aging will potentialize the effects of a high-fat diet to dysregulation of lipid homeostasis and increased fat accumulation. Wistar rats were obtained in the animal facility of the State University of Maringá, animals were divided in two groups, Young Adult (Y) 3 months old males and Old (O) 15 months old males. A batch of Y and O animals were ad libitum fed with standard chow (CO) or a high-fat diet (HFD - 35% lard), manufactured according to the AIN-93, for 2 months. Finally, there was 4 groups: Y-CO, Y-HFD, O-CO, O-HFD. Young and old animals were euthanized at 5 months old and 17 months old tissue and blood collection for biochemical analyzes. Data were analyzed by GraphPad prism, using two-way ANOVA and Tukey post-test. It was observed that both, age and diet increase total cholesterol ( $p < 0.0001$  and  $p < 0.0001$  respectively), also, it was observed an interaction between factors ( $p < 0.05$ ), indicating that age is able to potentialize increased cholesterol levels induced by diet.  $\beta$ -hydroxybutyrate levels was increased in old animals when compared to young ( $p < 0.05$ ), no interaction was observed. It was observed that diet and age was able to increase retroperitoneal ( $p < 0.0001$  and  $p < 0.0001$  respectively) and mesenteric fat ( $p < 0.0001$  and  $p < 0.0001$  respectively), despite that no interaction was observed between factors. Aging is able to increase adiposity and total cholesterol in normal fed animals. Aging potentialize hypercholesterolemia in high-fat fed animals, but it's not able to potentialize fat accumulation.

ID: 5368

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### HEPATOPROTECTIVE ACTION OF BOLDINE IN RATS WITH ACUTE LIVER INTOXICATION BY PARACETAMOL

Boldine is an alkaloid found in Chilean boldo (*Peumus boldus*). Recent studies revealed that boldine shows antioxidant and anti-inflammatory effects. Acetaminophen (paracetamol) is an analgesic and antipyretic drug widely used in the world and cases of acute liver intoxication are frequent. Therefore, the aim of this study was to evaluate the hepatoprotective and antioxidant action of boldine in rats with acute liver injury induced by paracetamol. Male Wistar rats (60 days weighing 250 g. CEUA-UEM 2512040520) received a single dose of paracetamol (2g/Kg of body weight). Boldine (20 mg/Kg) was administered soon after paracetamol administration and 24 hours after the first dose of boldine. Fasting animals (12 hours) were previously anesthetized, the blood was collected and the liver was removed and clamped. Plasma was separated and used to determine the activity of AST and ALT enzymes and oxidative parameters (thiols, TAC and content of protein carbonyl groups). The liver homogenate was used to determine the activity of CAT and SOD enzymes and tissue oxidative parameters (content of protein carbonyl groups and of glutathione). Acute paracetamol intoxication induced liver damage as observed by the increase in ALT and AST. Boldine treatment prevents hepatic injury. Neither acetaminophen nor boldine modified the plasmatic oxidative state. In the liver, the intoxication decreased catalase activity by 71%, while boldine increased CAT activity by 43% compared with the injury group. Besides that, acute intoxication decreased the glutathione (GSH) content by 55%. To conclude, the treatment with boldine presented a hepatoprotective action. However, this alkaloid was not able to prevent modification of the hepatic oxidative state induced by paracetamol acute intoxication.

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Área: *Fisiologia Celular*

Forma de Apresentação: *Ê-POSTER*

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### **CLOTRIMAZOLE INHIBITS PI3K AND MODULATES MACROPHAGE POLARIZATION**

Macrophages are extremely plastic myeloid cells responsive to stimuli from the microenvironment that can modulate their phenotype and function. These macrophages are main leukocytic infiltrates in tumors where are also known as TAM (tumor-associated macrophages) or M2-like, which plays an important role in tumor progression promoted by the crosstalk of these cells. Macrophage activation is widely described as M1 or M2 polarization. The M1 profile can be activated by IFN- $\gamma$ , LPS or both and the M2 profile can be activated by IL-4/IL-13, immune complexes, or glucocorticoids. The PI3K pathway is described as one of the most important mechanisms for regulating cell metabolism and proliferation, and some research suggests that this pathway plays a central role in regulating the macrophage activation phenotype. Clotrimazole (CTZ) is an imidazole derivative with antiproliferative activity mainly because it is involved in the inhibition of glycolytic enzymes and our group have shown that CTZ inhibits PI3K activation by inhibiting its catalytic site. The main objective of this work is to evaluate the inhibitory effect of PI3K by CTZ on macrophages polarization. Raw 264.7 and J774 macrophages were seeded in six-well plates ( $5 \times 10^5$  cells/well), after attachment the cells were treated with 20ng/mL of IL-4 for polarization to M2. After 24h, the media was removed and a fresh medium with CTZ (10 $\mu$ M) or with LY294002 (0.1 $\mu$ M) was added for 24h treatment. After 24h, the cells were stimulated with insulin (100nM) for 30 minutes. Cells were lysed and proteins were extracted for Western Blotting. Our data show that CTZ inhibits PI3K pathway activation observed by decreasing phosphorylation of downstream effectors of this pathway. Furthermore, differences in the expression of M1 and M2 markers such as iNOS and arginase, respectively, are observed. The present work supports the inhibition of PI3K by CTZ and, in parallel, the role of PI3K in the macrophage polarization process.

ID: 5373

Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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## PSYCHOSOCIAL FACTORS AS ADDITIONAL CARDIOMETABOLIC RISK FACTORS IN A POPULATION WITH PERSISTENT PAIN AND SLEEP DISTURBANCES

Cardiometabolic disorders (CMD) are often linked to insomnia and sleep disordered breathing (SDB). Chronic pain leads to an increase on cardiometabolic risk due to sympathetic hyperactivation or indirect psychosocial factors involved in CMD pathogenesis. Such burden may have deleterious effect on pain itself and on general health and well-being. This study aimed at evaluating insomnia, SDB and cardiometabolic risk factors (CMRF) and their interactions in patients (pts) seeking care at an orofacial pain clinic. Anonymized data of 1236 adult pts, both sexes (69.1% women), aged [18 to 89] years was extracted from a self-screening platform. Prevalence data was estimated for insomnia (ISI>8), SDB (positive answer for snoring and/or apnea complaints) and COMISA (Insomnia + SDB) regarding demographics and CMRF (BMI, smoking history and drinking history). Psychometric tests for anxiety (GAD-7) and depression (PHQ-4 and PHQ-Str) were applied to assess psychosocial stress factors. Descriptive statistical analysis and analysis of variance were used (signif. level set at  $p \leq 0.05$ ). Results show that 384 pts (31.1%) had subclinical ( $n=184$ ) or clinical insomnia ( $n=200$ ); 310 pts (25.0%) confirmed to snore or have sleep apnea and 142 pts (11.5%) had COMISA. COMISA pts BMI was higher than those with insomnia only, but not different from those with only SDB. Tobacco smoking was more frequent among COMISA pts (23.9%) than in pts with isolated conditions (12% for insomnia; 22.0% for SDB). Drinking history was more frequent ( $p=0.007$ ) in SDB (16.1%) and COMISA (14.1%) pts than in insomniacs (7%). Anxiety, depression and stress were significantly higher in COMISA pts than in pts with isolated insomnia or SDB. Pts with COMISA seem to have higher risk for CMD compared with those with insomnia or SDB alone. Thus, beyond risk factors as BMI, smoking and drinking history, additional psychosocial stress dimensions may significantly contribute to CMD risk with important clinical implications.

ID: 5374

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## ADMINISTRATION OF FERRIHYDRITE AND ROUNDUP® IN WISTAR RAT MATRICES DURING PREGNANCY AND LACTATION: EFFECTS ON OFFSPRING

Roundup® (R), whose active ingredient is glyphosate, can lead to enzymatic, cellular, and hormonal changes in offspring of matrices treated with this herbicide. Ferrihydrate (F) is an iron oxide nanoparticle that adsorbs herbicides, so this study evaluated if it could prevent changes in body weight (bw), food intake (fi), and sexual development in offspring of matrices subjected to R administration. Male ( $n=7$ ) and female ( $n=14$ ) Wistar rats (90 days) were mated. The female received a single daily dose (600 mg/kg bw of each substance, via gavage) of F, R or your association (FR) during pregnancy and lactation; water was used as control (C). After birth, offspring were reduced to 4 males (m) and 4 females (f) per matrice. Data were expressed as mean $\pm$ SEM and one-way ANOVA followed by SNK post-test ( $p<0.05$ ) was used. Protocol approved by CEUA ( $n^{\circ}$  22917.2017.47). No changes were observed in bw, fi, and reproductive parameters (implantation rate, pre-implantation and post-implantation loss, fetal viability, number of corpora lutea, and number of born fetuses) in the matrices. The female offspring did not show changes in bw, fi, sexual organ mass, and estrous cycle. However, vaginal opening occurred earlier ( $p<0.001$ ) in Rf ( $31.0\pm 0.7$  days) and FRf ( $30.0\pm 0.6$  days) compared to Cf ( $34.0\pm 0.5$  days). Bw

or fi did not changed in male offspring, but the weight (g) of sexual organs of Rm were higher ( $p < 0.05$ ) than Cm to epididymis (Rm:  $0.28 \pm 0.01$ ; Cm:  $0.24 \pm 0.01$ ) and also higher than FRm to prostate (Rm:  $0.23 \pm 0.01$ ; Cm:  $0.19 \pm 0.01$ ; FRm:  $0.21 \pm 0.01$ ), full seminal vesicle (Rm:  $0.69 \pm 0.04$ ; Cm:  $0.54 \pm 0.04$ ; FRm:  $0.61 \pm 0.03$ ), and empty seminal vesicle (Rm:  $0.39 \pm 0.02$ ; Cm:  $0.32 \pm 0.02$ ; FRm:  $0.34 \pm 0.01$ ), as well as, delay on preputial detachment (days,  $p < 0.05$ ) in Rm ( $47.0 \pm 0.6$ ) compared to Cm ( $43.0 \pm 0.4$ ) and FRm ( $42.0 \pm 0.2$ ). Ferrhydrite did not prevent early vaginal opening in females, but protected against changes in sex organ mass and preputial detachment by Roundup® in males.

ID: 5375

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **PURINERGIC MODULATION OF AMINO-ACID TRANSPORTERS IN THE HUMAN BRAIN – PUTATIVE PATHOPHYSIOLOGICAL IMPLICATIONS**

About 30% of epilepsy patients suffer from drug-resistant Mesial Temporal Lobe Epilepsy (MTLE), yet only few are eligible for surgery as last resource treatment, leaving the remaining patients with an unmet clinical need. Thus, there is an urgent need to better understand the phenomena underlying epileptogenesis and recurrent seizures. High-affinity transporters for  $\gamma$ -aminobutyric acid (GABA) and glutamate control neuronal excitability in the CNS. These processes are kept in pace through sophisticated local mechanisms, which when unbalanced facilitate seizures. Recently, ATP and adenosine emerged as potential candidates to fine tuning modulate amino-acids transport since their extracellular levels rapidly increase in the brain during excessive neuronal firing and other pathological conditions allowing the spatial and temporal cohabitation of the two purines with GABA and glutamate neurotransmitters. Our group showed that transient activation of P2X7 and A2A receptors by massive quantities of ATP released during neuronal firing and its subsequent extracellular conversion to adenosine facilitates glutamatergic transmission while favoring endurance of GABAergic neurotransmission. Despite this may ensure tonic neuro-inhibition following intense neuronal activation and may be physiologically relevant to allow synaptic plasticity for learning and memory, overexpression of neuronal P2X7 and astrocytic A2A receptors in MTLE patients may be dangerous and foment epileptic discharges. This may be so because purinergic-induced persistence of GABA mediated neurotransmission may result in GABAergic rundown, a process by which GABAergic inhibition is converted into a pro-convulsive action by promoting neuronal hyperexcitability, instead of inhibition. Thus, the pharmacological blockage of P2X7 and A2A receptors has emerged as novel therapeutic alternatives for drug-resistant epilepsy in humans.

ID: 5376

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### THE EFFECT OF VITAMIN C ON HEART AND KIDNEY IN RENAL ISCHEMIA/REPERFUSION-INDUCED CARDIORENAL SYNDROME 3 IN MICE

The cardiorenal syndrome type 3 (CRS3) is characterized by acute kidney injury leading to cardiac alterations. Mitochondria dysfunction and reactive oxygen species have been reported on CRS3 pathophysiology. Vitamin C has been highlighted as therapeutic approach against renal and cardiac injuries. We aimed to evaluate the effect of vitamin C on heart and kidney in renal ischemia/reperfusion-induced cardiorenal syndrome 3 in mice. C57Bl/6 male, 20-28g and 6-8 weeks (Ethics Committee 5593240919) were submitted to unilateral renal ischemia for 60 minutes followed by reperfusion for 8, 15 and 23 days (I/R), treated or not with VitC (57mg/Kg/day,d.w) for 8 days since surgery day (I/R Early), 15 days after I/R (I/R Late). Mice were divided into Sham, I/R8d, I/R15d, I/R Early and I/R Late. High respirometry resolution (nmol/sec/mg) was performed and nitrite were determined using amperometry (pmol/ $\mu$ g). Data were expressed as mean $\pm$ SD and statistical analysis were made by ANOVA-one way and Tukey posttest, p values < 0.05 were statically significant. On left kidney I/R induced an increase on nitrite levels (541%) and decreased mitochondria oxygen consumption (Sham:3.50 $\pm$ 1.18 vs I/R15d:1.79 $\pm$ 0.10). VitC administered concurrently with surgery kept nitrite elevated similar to I/R15d and reduced in I/R Late (I/R15d:15165.2 $\pm$ 3841.37 vs I/R Late:5350.42 $\pm$ 2869.26) and it didn't improve oxygen consumption. On heart, it was observed an impairment on oxygen consumption on I/R15d (Sham:5.41 $\pm$ 1.22 vs I/R15d:2.81 $\pm$ 0.17). Nitrite was reduced on 15 days of reperfusion (Sham:12125.92  $\pm$  9907.75 vs I/R15d:4823.39  $\pm$ 1446.28). I/R Early showed a restoration of nitrite (I/R15d:4823.39 $\pm$ 1446.28 vs I/R Early:17193.93 $\pm$ 6714.56) and improved oxygen consumption (Sham: 5.41 $\pm$ 1.22 vs I/R Early: 5.90 $\pm$ 0.67). The model of renal I/R induced impairments on mitochondrial function in both kidney and heart. Vitamin C was capable of modulate the levels of NO and promote different improvements to kidney and heart tissue.

ID: 5379

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### THE CAROTID BODY DETECTS CIRCULATING TUMOR NECROSIS FACTOR-ALPHA TO ACTIVATE THE SYMPATHETIC NERVOUS SYSTEM

Recent evidence has indicated that the carotid body (CB) might act as an immunological sensor, detecting pro-inflammatory molecules and conveying this information to the central nervous system (CNS), which, in turn, orchestrates autonomic responses. Here, we demonstrated that the CB of male Holtzman rats expresses receptors (type I) for tumor necrosis factor alpha (TNF- $\alpha$ ), a proinflammatory cytokine. The systemic administration of TNF- $\alpha$  (500 ng, i.v.), in anesthetized rats caused a sustained increase in CB afferent activity at 30, 60, 90, and 120 minutes after its administration (n=6, p<0.05 compared to baseline). In addition, the systemic administration of TNF- $\alpha$  activated excitatory neurons (VGluT2-positive) within the commissural nucleus tractus solitarius (cNTS), the first relay site for CB

afferents in the CNS. Importantly, a high proportion of these activated glutamatergic neurons were found to project to the rostral ventrolateral medulla (RVLM), where the majority of pre-sympathetic neurons are located. The activation of the cNTS-RVLM glutamatergic neurons was accompanied by increases in splanchnic, renal and lumbar sympathetic nerve activity (SNA). Bilateral CB ablation (CB-X) blunted the TNF- $\alpha$ -induced neuronal (n=4 per group, p<0.05 vs. control) and sympathetic activation (n=6 per group, p<0.05 vs. control). The present findings suggest that the CB detects elevated circulating TNF- $\alpha$  to activate central sympathetic networks increasing SNA. This mechanism may represent an important connection between the immune and the nervous systems that might be involved in the pathophysiology of sympathetically mediated diseases such as hypertension and heart failure.

ID: 5380

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **EXPOSURE TO SECONDHAND CIGARETTE SMOKE REDUCES RESPIRATORY CHAIN PROTEINS EXPRESSION IN THE SKELETAL MUSCLE OF RATS**

Smoking causes 6 million deaths per year. Resistance training (RT) was classified as one of the best treatments for patients with chronic obstructive pulmonary disease (COPD), the usual disease in smokers. Although several benefits of RT have already been described, there is no consensus about its real contribution to OXPHOS proteins in smokers. The present study aimed to evaluate the expression of OXPHOS proteins in the skeletal muscle of rats practicing RT and/or smokers. The experimental protocol was approved by CEUA nº 02/2017. Twenty-four Wistar rats were divided into groups: Control (C), Smoker (S), Exercised (E) and Exercised Smoker (ES). The smoking groups were exposed to smoke from four cigarettes for 30 minutes, twice a day, 5 times a week, for 16 weeks. The exercised groups performed four climbs with progressive load, once a day, 5x a week, for 16 weeks. The gastrocnemius muscle was removed to quantification of OXPHOS (CI-CV) proteins (ab110413) by Western Blotting. S (vs C; p=0.01) and ES (vs C p=0.001 and E p=0.01) rats showed lower weight gain without difference in the gastrocnemius muscle weight. S rats showed a reduction in the protein content of NDUFB8 (CI; p=0.03), SDHB (CII; p=0.02), and ATP5A (CV - ATP Synthase; p=0.02), compared to the C group. CI and CII are responsible for the binding and oxidation of NADH and FADH, respectively. With the reduction of such relevant proteins in these complexes, a limitation in the electrochemical gradient between mitochondrial membranes ( $\Delta\mu H$ ) is suggested (Jarovsky D; Einstein.4:4,2006). Consequently, the reduction of the ATP5A protein suggests an impairment of the F0 subunit of ATP Synthase, which would act by dissipating  $\Delta\mu H$ . The animals ES and E did not show any reduction of OXPHOS protein. Conclusion: We conclude that secondary exposure to the cigarette smoke reduces the protein content of NDUFB8, SDHB, and ATP5A in murine skeletal muscle, which was avoided with RT.

ID: 5383

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **CHRONIC EXPOSURE TO MERCURY AGGRAVATES THE EFFECTS OF ACUTE MYOCARDIAL INFARCTION IN WISTAR RATS**

The present study evaluated whether chronic exposure to mercury can increase mortality and arrhythmias, and worse complications triggered by acute myocardial infarction. Adult male Wistar rats aged 12 weeks were divided into four groups: Sham + Saline, Sham + Hg, MI, and MI + Hg. Animals received intramuscular injections of mercury (first dose 4.6µg/kg, subsequent dose 0.07µg/kg/day, to cover daily loss) or vehicle-saline solution for three weeks. At the end of the third week, the animals were submitted to sham or infarction through of ligation of the anterior descending left coronary artery. Electrocardiographic (ECG) recordings were performed five minutes before and twenty minutes after surgeries. The measured parameters were the electrocardiogram (ECG) tracing, heart rate (HR); number of ventricular extra systoles (VES); number and duration of ventricular tachycardia (VT). (CEUA: 20/2018 and 24/2020) The area of myocardial infarction was not different between the MI (46.52%) and MI + Hg (46.17%) groups. Following infarction, the group treated with mercury had a mortality rate of 41.18% while the control group had mortality of 25%. The QRS interval (iQRS) of the MI + Hg group was enlarged after surgical procedure when compared with the control group (Sham + Saline). There were no significant differences in the heart rate (HR) between groups. Only the group that associated infarction with mercury exposure (MI + Hg) showed a significant increase in the number of ventricular extra systoles (VES) when compared with the control group (Sham + Saline). Infarcted animals (MI and MI + Hg) had a higher frequency of ventricular tachycardia (VT) than control animals (SHAM + Saline). This study suggests that the association between MI and mercury exposure has led to higher mortality, as well as aggravation of cardiac arrhythmias.

*ID: 5384*

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER*

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### **POST-NATAL FRUCTOSE OVERLOAD – IMPACT ON RENAL FUNCTIONAL PARAMETERS OF YOUNG RATS**

Proper nutrition is essential for health. After lactation, many children start consuming processed foods rich in fructose. The overconsumption of these foods can predispose to non-communicable chronic diseases. Furthermore, there is evidence that certain diseases can occur in different ways depending on gender. Aims: to evaluate the effects of fructose overload introduced after weaning on renal function of young rats of both sexes. Offspring from Wistar rats were studied. After weaning 8 male and 8 female were assigned to drink water (Male/Water – MW; Female/Water - F/W); and 8 male and 8 female to drink D-fructose 20% (Male/Fructose – MF; Female/Fructose - F/F). All rats received food and liquid ad libitum and were evaluated at age of 4 months. Parameters analyzed: food (FI) and liquid (LI) intake, urea (Ur) and creatinine (Cr) plasma concentrations, urinary volume (UV), proteinuria (Uprot), sodium (UNa), and potassium (UK) excretion, creatinine clearance (glomerular filtration rate - GFR), serum lipid profile and fasting glycemia (Gly). CEUA: 2757270117. Results shown as mean±standard error; p≤0.05 t-test.

Fructose drinking solution caused in both sexes: increase in: LI [M/W: 26.6±2.4; M/F: 42.4±4.9\*; F/W: 26.8±1.2; F/F: 37.3±3.4\* ml/24h]; Gly [M/W: 71.7±2.2; M/F: 109.5±5.4\*; F/W: 84.0±2.5; F/F: 115.8±4.2\* mg/dl], triglycerides [M/W: 68.0±10.7; M/F: 115.0±9.8\*; F/W: 44.5±4.8; F/F: 95.3±16.0\* mg/dl]; reduction in: Ur [M/W: 45.5±2.2; M/F: 30.8±2.7\*; F/W: 42.4±2.2; F/F: 28.3±1.3\* mg/dl], in UNa [M/W: 3.2±0.2; M/F: 2.2±0.3\*; F/W: 4.6±0.3; F/F: 2.6±0.2\* mEq/24h], UK [M/W: 8.4±0.6; M/F: 5.1±0.7\*; F/W: 12.1±0.7; F/F: 6.7±0.6\* mEq/24h]. Only M/F had reduction in GFR [M/W: 8.9±1.2; M/F: 6.0±0.7\*; F/W: 7.5±0.7; F/F: 6.6±0.5 ml/min/kg] and in FI [M/W: 19.4±1.1; M/F: 12.7±1.1\*; F/W: 17.6±1.2; F/F: 17.9±2 g/24h]. Conclusions: Fructose overload since weaning caused metabolic changes in both sexes, but renal function in males was more affected by the treatment.

ID: 5385

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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#### EVALUATION OF THE PHYSIOLOGICAL EFFECTS OF $\alpha$ -GLUCOSIDASE SILENCING IN RHODNIUS PROLIXUS AND THE IMPACT ON TRYPANOSOMA CRUZI INFECTION

During digestion of hematophagous insects, heme is released, which in free form and in high concentrations causes deleterious effects to the cells. For this, there are mechanisms that promote the detoxification of this molecule. In *Rhodnius prolixus*, both the perimicrovillar membranes (MPMV) and its biochemical marker, the enzyme  $\alpha$ -glucosidase, are responsible for the synthesis of the hemozoin crystal (Hz). This mechanism is also beneficial for the *Trypanosoma cruzi*, which has a favorable environment to develop. Thus, new alternatives aim to evaluate the impact of knockdown of intrinsic components of blood digestion to understand the parasite-vector relationship. To address this hypothesis, we will investigate the effect of gene silencing of  $\alpha$ -glucosidase in the midgut of *R. prolixus*, to assess the potential effects on metacyclogenesis of the parasite *T. cruzi*. For this, 30 *R. prolixus* female (CEUA-CCS/UFRJ n° 006/21) on the second blood feeding cycle and weight between 0.06 g-0.1 g, will be knockdown for  $\alpha$ -glucosidase or GFP as control via RNAi injected into hemocoel (2 $\mu$ g of dsRNA). Insects 4 days after rabbit blood feeding will be dissected to remove the intestinal epithelium to RT-qPCR analysis,  $\alpha$ -glucosidase activity, its contents for Hz extraction and hemoglobin degradation profile. Subsequently, they will be infected with *T. cruzi* and the rate of parasite development at different times post-infection will be evaluated. In preliminary bioinformatics results, molecular characterization of the G isoform  $\alpha$ -glucosidase was performed, relying on sequence and structure prediction, in choosing a template to build the three-dimensional structure of the protein and, in the step, performing docking with the heme molecule. Taken together, it is expected that the dysfunction in hemoglobin digestion, caused by silencing the  $\alpha$ -glucosidase, can inhibit parasite development, which would directly influence the transmission of the pathogen, configuring a form of vector control.

ID: 5386

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **BENEFITS OF NARINGENIN ON THE CARDIOVASCULAR AND RENAL FUNCTION OF NORMOTENSIVE AND SPONTANEOUSLY HYPERTENSION RATS**

Naringenin (NGEN) is a well-known flavonoid belonging to the chemical class of flavanones abundant in citrus fruit. Studies have shown that naringenin exerts antioxidant, antiallergic, antibacterial, anti-inflammatory, antimutagenic and anticancer effects. Gao, et al 2018 and 2019 showed that naringenin played a protective role in hypertensive myocardial hypertrophy and ameliorated hypertensive nephropathy in rats, respectively. The present study tested the effect of naringenin on isolated heart and renal function in spontaneously hypertensive rats (SHR). Naringenin (50 mg/kg/day, 0.1 mL by gavage) was administered for 10 weeks in Wistar Naringenin rats (WN) and SHR naringenin (SHRN). Wistar control rats (WC) and SHR control (SHRC) received oil. Systolic pressure was continuously monitored by tail-cuff methods. At the end of treatment, rats were placed in metabolic cages for 12 hours. Then, the rats were anesthetized and blood and tissue were collected. Some biochemical parameters of plasma, liver and kidney were evaluated. Cardiac function was assessed using the Langerdorf system. The heart was isolated and perfused with Krebs-Henseleit solution through the coronary artery. (CEUA/UFG 49/19). Systolic pressures were 111.3±6.2, 106.9±2.7, 193.3±2.9, 190.7±4.6 mmHg at WO, WC, SHRO, SHRN, respectively, at the end of treatment. Significant differences were found between SHR and wistar as corporal, heart and adrenal weight but no differences were produced by treatment. Aspartate Aminotransferase (AST) and proteinuria was increased in SHRO and it was attenuated in SHRN. It was no difference observed at basal values of heart isolated but treatment decreased intraventricular systolic pressure and dP/dt positive in response to bradykinin bolus. In conclusion, Naringenin promoted benefits in renal parameters and cardiovascular function, but the mechanisms must be investigated.

ID: 5389

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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### **EFFECTS OF ETHANOLIC EXTRACT FROM THE LEAVES OF ETHANOLIC JAMBU (ACMELLA OLERACEA) IN CARDIOVASCULAR AND RENAL FUNCTION IN NORMOTENSIVE AND SPONTANEOUSLY HYPERTENSIVE RATS**

In folk medicine, Jambu (*Acmella oleracea*) is an important medicinal plant whose leaves and flowers are used as a local anesthetic. Several studies have shown therapeutic potential of the Jambu as an anti-inflammatory, antinociceptive, antioxidant and diuretic. Wongsawatkul et al., 2008 showed a vasorelaxant and antioxidant activities of *S. acmella* in rat thoracic aorta. In the present study, we investigated the effects of early treatment with Jambu extract on cardiovascular and renal function in young rats. Jambu ethanolic leaves extract (100 mg/kg/day, 0.1 mL) or vehicle (saline) was administered for 60 days by gavage in rats with sixty days old. Wistar and SHR rats were divided into saline treated groups WC and SHRC, and Jambu extract treated groups WT and SHRT groups, respectively. Systolic pressure was

monitored during all treatment using tail-cuff methods. At the end, rats were placed in metabolic cages for 12 hours, then anesthetized and blood and tissue collected. Biochemical parameters of plasma, liver and kidney were evaluated. The heart was isolated and perfused with krebs-Henseleit solution through the coronary artery using the Langerdorf system. Vascular reactivity test was performed in the rat aortic ring preparation. (CEUA/UFG 65/19). Systolic values of WC, WT, SHRC and SHRT were  $104.7 \pm 2.2$ ,  $107.9$ ,  $106.9 \pm 3.4$ ,  $181.6 \pm 5.7$  and  $195.8 \pm 8.8$ , respectively. There was an increase in AST and a decrease in plasma creatinine in SHRC when compared to WC and the treatment with Jambu did not change. In cardiac function, there was a reduction in intraventricular pressure in SHRC compared to WC and increased treatment with Jambu. In studies of rat thoracic aorta, the vasodilation of the Nitro response of WT rats was better and in SHRT the vasoconstrictor effect of PHE was reduced. The results suggest that treatment of young rats with Jambu extract improved the cardiovascular system of wistar and hypertensive rats, which may indicate more significant results in older rats.

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Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **VENTILATORY RESPONSE TO HYPERCAPNIA IN FEMALE RATS SUSCEPTIBLE TO EPILEPTIC SEIZURES (WAR STRAIN)**

The Wistar Audiogenic Rat (WAR) strain is susceptible to seizures. Previous evidence showed alterations in the respiratory control in adult male WAR rats. This is however not known in female WAR. The goal was to characterize the ventilatory responses to hypercapnia in female WAR rats across the estrous cycle. Adult Wistar and WAR rats (250-270g; n=8 and n=10, respectively; CEUA: 87/2018) were housed in a 12h light-dark cycle. Vaginal smear was performed every day for two weeks. Whole body plethysmography was performed to measure ventilatory variables (respiratory frequency, F; tidal volume, VT; and ventilation, VE) in room air and in hypercapnic (7% CO<sub>2</sub>) conditions. This was performed in different phases of the estrous cycle: in the diestrus morning (DM), proestrus morning (PM; 9h-12h am) and proestrus evening (PE; 4h -7h pm). The body temperature (rectal) was measured before and after each VE measurement. Statistical analysis was performed using ANOVA two-way RM (p<0.05). During room air, no difference was observed in the ventilatory variables during the phases of the estrous cycle. The WAR group had a smaller F only in the DM of estrous cycle, compared to Wistar ( $110 \pm 6$  and  $85 \pm 3$  cycles/min, Wistar vs WAR, respectively, p<0.05). No difference was observed in the VT and VE between Wistar and WAR. All rats presented ventilatory responses to CO<sub>2</sub>, which was similar across the estrous cycle. However, the WAR group had a significantly attenuated hypercapnic ventilatory response compared to Wistar (p<0.05), regardless of the phase of the estrous cycle. This was mainly due to a significant lower F in the WAR group, while VT was not different. The present data demonstrated that female WAR rats have an attenuated ventilatory response to hypercapnia compared to control female Wistar rats, regardless of the phase of the estrous cycle. These open new perspectives to study breathing control in female rats and pursue mechanisms that may revert this respiratory phenotype.

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Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### **TREATMENT WITH RITALIN® IN ADOLESCENCE LEADS TO GREATER INSULIN TOLERANCE IN THE ADULT LIFE OF RATS**

The prevalence of attention deficit hyperactivity disorder (ADHD) has increased in recent years in childhood and adolescence. Thus, the most used treatment is the administration of Methylphenidate, active ingredient of the drug Ritalina®. The aim of this work is to investigate the effect of treatment with Ritalin® during adolescence on the body fat composition and metabolism of adult rats. Male Wistar rats received Ritalin® at a dose of 5 mg / kg of body weight from 30 to 60 days of life ( Rit group), control animals received 0.9% Saline in the same volume (Sal group). At 60 and 120 days, metabolic parameters were evaluated. Both at 60 and 120 days there was no increase in body weight of Rit animals in relation to the Sal group ( $p > 0.4$ ), at 60 and 120 days there was also no statistical difference between groups in relation to food intake ( $p > 0.6$ ). At 60 days the Rit animals had 28.33% triglycerides increased in relation to the Sal animals ( $p < 0.002$ ), while at 120 days in relation to this same parameter the Rit group was 25.2% lower in relation to the Sal group ( $p < 0.02$ ). As for body fats, at 60 days, there was a decrease of 26.5% and 22.8% in perigonadal and mesenteric fats, respectively, in the Rit group in relation to the Sal group ( $p < 0.3$  and  $p < 0.2$ ), in relation to at the same parameter, at 120 days, there was an increase of 28.5% in mesenteric fat of Rit animals compared to the Sal group ( $p < 0.2$ ), there was no statistical difference in relation to other body fats. There was an increase of 17.8% in the Rit group, at 60 days, compared to the Sal group ( $p < 0.02$ ) in relation to the insulin tolerance test (ITT), in the same parameter, at 120 days, the Rit animals had an increase 33.3% in relation to the Sal group ( $p < 0.008$ ). Treatment with Ritalin® in adolescence generates an increase in body fats during treatment, however, in adulthood, there is a decrease in them, there is an increase in insulin tolerance both during treatment and in adulthood.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **BLOOD PRESSURE AND ITS DETERMINANTS IN HOT ENVIRONMENT: ARE THERE SEX DIFFERENCES?**

Heat stress increases peripheral vasodilatation and blood flow redistribution to the skin as a mechanism of heat loss that may reduce total peripheral resistance (TPR) and blood pressure (BP). Sex differences in both peripheral and neural mechanisms of BP control have been reported in a thermoneutral

environment. However, little is known regarding BP responses and its determinants between males and females under a heated environment. This study (CEP:1.252.971/2015) aimed to investigate the hemodynamic responses in males and females exposed to heat stress. Sixteen healthy individuals (27 ±5 years old, eight women in follicular phase) rested for 30min in two environmental conditions on the same day, thermal stress (HOT ~36°C) and thermoneutral (TC ~24°C), in randomized order. BP, stroke volume (SV), heart rate (HR), cardiac output (CO) were continuously recorded and, TPR was calculated (TPR= mean BP/CO). The data were analyzed in the last five minutes. TPR, SV and CO were adjusted by body surface (TPR<sub>i</sub>, SV<sub>i</sub> and CI, respectively). The variation between TC and HOT was calculated ( $\Delta$ = HOT – TC), and the unpaired t-test was used to compare these responses between sexes. Women presented greater reductions in  $\Delta$ BP (male 8 ±12 vs. female -20 ±16 mmHg; p <0.001) and  $\Delta$ TPR<sub>i</sub> (male 1.2 ±6.7 vs. female -6.9 ±6.2 a.u.; p<0.001) compared to men.  $\Delta$ SV<sub>i</sub>,  $\Delta$ CI and  $\Delta$ HR were not different between sexes (p>0.05). Women tend to have lower blood volume as well as differences in the neural control of circulation. Young women tend to have less vascular sympathetic nerve activity and greater beta-adrenergic vasodilation in the peripheral circulation compared to age-matched men. Therefore, the present findings suggest that the blood pressure decreased in heat due to the greater decrease in total peripheral resistance in women compared to men.

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Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **THE FIRST STEP TO BUILD A REFERENCE POPULATION OF ANIMALS (SPRAGUE-DAWLEY RATS) FOR BIOELECTRICAL IMPEDANCE VECTOR ANALYSIS (BIVA)**

Cancer promotes loss of muscle mass, promoting sarcopenia or cachexia. Bioelectrical impedance analysis (BIA) is a non-invasive method of measuring human body composition. BIA provides two main information, Resistance (R – Ohms) and Reactance (Xc – Ohms), the first one assesses the cellular hydration and the second tissue integrity and Phase Angle (PhA – degrees). The bioelectrical impedance vector analysis (BIVA) is a variation of BIA, the information like R, Xc and PhA are plotted in the R(h)/Xc(h) graph that is draw from a healthy reference population. The aim of this project is to build a reference population of healthy rats, and compare with cancer rats using raw values from BIA. First, the rubber superficial was made to immobilize the animals and not propagate the electrical signal, besides, the BIA equipment has been used, and was manufactured by Rushford NanoElectroChemistry Company, MN 55791 model, with 50Khz of frequency. Seventy-nine Sprague-Dawley rats with 45 day-old and without cancer were measured (collect 1) the R and Xc one-by-one, and the PhA was calculated using the mathematical formula arc-tangent (Xc/R) x (180°/π). After 84 days of induction cancer from Dimethylbenz Anthracene (DMBA) the second measure (collect 2) by BIA is done with 76 animals (CEUA under protocol n. 02/2020 FCT/UNESP). The results are, collect 1 R= 335.67±36.30, Xc= 33.20±8.60 and Person's correlation = 0.32, collect 2 R= 277.07±33.87, Xc= 29.62±8.42 and Person's correlation = 0.67. Is tough to find some papers and articles with parameters and instructions to use and understand measures from BIA and BIVA in experiments with animals and cancer, however, this tool is easy to operate and demonstrates important information about body composition and integrity of cell membrane. In conclusion, the confidence ellipse indicates a reduction of R and Xc and an increasing of PhA, between collect 1 and 2, nevertheless, more analysis and measures by BIA are necessary.

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Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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### **NETS RELEASE FROM PERIPHERAL BLOOD NEUTROPHILS FROM PATIENTS WITH CHAGAS DISEASE: CORRELATION WITH ECHOCARDIOGRAM PARAMETERS AND RISK OF DEATH**

In the chronic phase of Chagas disease (CD), approximately 30% of patients develop chronic Chagas cardiomyopathy (CCC). The echocardiogram (ECHO) is used for evaluating these clinical manifestations, which are caused, among other factors, by the accumulation of inflammatory cells, such as neutrophils, in the myocardium. These cells can interact with *Trypanosoma cruzi* and perform effector functions such as NETs release (Neutrophils extracellular traps). Despite this, few studies have investigated the correlation of these functions with the clinical parameters obtained from ECHO. Here, we evaluated NETs released by neutrophils from peripheral blood of patients with chronic CD, presenting the indeterminate or cardiac (CARD) clinical forms, and related it to the ECHO parameters and the risk of death. The quantification of the formation and release of NET was performed using fluorescence (PicoGreen® dsDNA assay kit). Visualization was possible using fluorescence microscopy. Clinical variables were obtained through the analysis of the medical records. The study was approved under the protocol CEP/UERN n.2.672.657. Neutrophils from patients with the CARD clinical form release less NETs ( $113.3 \pm 19.66$  ng/mL; \* $p=0.0014$ ) than neutrophils from non-infected individuals ( $177.2 \pm 58.33$  ng/mL). When correlating this with the ECHO parameters, we found negative correlation with the left ventricular systolic diameter ( $r= -0.07998$ ; \* $p= 0.0097$ ) and the left ventricular mass index ( $r=-0.7743$ ; \* $p=0.0086$ ), in addition to a positive correlation with the left ventricular ejection fraction ( $r= 0.6539$ ; \* $p= 0.0403$ ). Finally, we observed that the lower the release of NETs in patients with cardiac involvement, the greater their risk of death ( $r= -0.6574$ ; \* $p= 0.0173$ ). These results suggest that the functional response of neutrophils may be influencing the cardiac events in these patients or the clinical evolution of CD is compromising the effector functions of these cells.

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Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **RESISTANCE TRAINING IS ABLE TO PREVENT LOCAL AND SYSTEMIC CHANGES IN RATS FED HIGH-CALORIE DIET**

Obesity causes several systemic and local alterations in the individual<sup>1,2</sup>. Many approaches have been used as an attempt to prevent or reverse this condition<sup>3</sup>. Exercise is one of the oldest, cheapest and promising tools to combat this disease<sup>3</sup>. The aim was to analyze the impact of resistance training (RT) on hepatocardiovascular and muscle mitochondrial indicators in rats fed high-calorie diet. The study was approved by local Ethics Committee on the Use of Animals (CEUA), protocol #01/2017. Thirty-six male Wistar rats (*Rattus norvegicus*) weighing 200±50g with 50 days were divided into groups: Control (C), Obese (O), Exercised (E), and Obese exercised (OE). E and OE performed RT on a vertical ladder with progressive load coupled to the tail, 1x/day, 5x/week for 12 weeks. O and OE were fed a high-calorie diet, mixed chow, and cafeteria diet for 12 weeks. After euthanasia under anesthesia, the heart and liver were removed for histopathological analysis and the gastrocnemius muscle for RT-PCR and Western Blotting assays. O group vs C, E and OE was heavier with bodyweight  $P < 0.0001$ ; increased fat mass with absolute weight of the periepididymal adipose tissue  $P < 0.0001$ ; elevated fasting glycemia  $P < 0.001$ ; total triglycerides  $P < 0.0001$ , showing an increased number of Kupffer cells and steatosis in the liver  $P < 0.05$ . O also showed a greater thickness of the right ventricle  $P < 0.05$ , septum  $P < 0.0001$ , and pulmonary artery  $P < 0.0001$ . All of these changes were mitigated by RT. Ppargc1a mRNA and protein levels were increased in the exercised groups  $P < 0.001$ . TFAM and NRF1 gene levels were reduced in the O  $P < 0.05$ ; Cysc gene level was increased in the exercised groups  $P < 0.001$ . OXPHOS complexes III, IV, and V protein levels were reduced in the O, while RT prevented this. We concluded RT showed a protective role against hepatocardial modifications, as well as, preventing changes in the pattern of muscle mitochondrial proteins caused by a hypercaloric diet.

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Área: *Fisiologia Celular*

Forma de Apresentação: *Ê-POSTER*

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### **LUNATIN-1 IS A SCORPION VENOM PEPTIDE THAT INDUCES CELULAR DEATH IN LNCAP PROSTATE CANCER CELL LINE**

**Introduction:** Previous studies demonstrated that Lunatin-1, a peptide isolated from *Hadruroides lunatus* scorpion venom, regulates apoptosis in human promyelocytic leukemia HL-60 cell line as well as induces death in MCF-7 and MDA-231 human metastatic cancer cells lines by unknown mechanisms. **Aim:** To evaluate the potential Lunatin-1 anti-tumor activity in LNCap metastatic human prostate cancer cells. **Methods:** Synthetic Lunatin-1 was purified by high-performance liquid chromatography (HPLC). Purified Lunatin-1 was analysed by mass spectrometry (MALDITOF/TOF) for quality control of synthesis and purification. Lunatin-1 similarity search against human proteins was performed by Blast online tool. Gene ontology was done by GhostKhoaala and David online tools. LNCap cells were treated with different concentrations of Lunatin-1 and cell viability after the treatment was evaluated by Rezarzurin assay. **Results:** Lunatin-1 was successfully purified as confirmed by mass spectrometry. Lunatin-1 induced cytotoxicity in LNCap cells even in the lowest concentration used (1.5 µM,  $p < 0.001$ ). On the other hand, Lunatin-1 was cytotoxic for nontumoral cell (HEK-293) only at higher concentrations ( $\geq 25$  µM). Therefore, Lunatin-1 presents different cytotoxic activity when comparing tumoral and non-tumoral cell lines ( $p < 0.001$ ). Bioinformatic analysis demonstrated that Lunatin-1 has high sequence similarity with proteins related to alternative splicing, phosphoproteins, cancer proteins and prostate neoplasm proteins. **Discussion:** Our results show that Lunatin-1 possess a potential antitumor activity, presenting

low toxicity in non-tumoral cells. Since Lunatin-1 is similar to cancer proteins and prostate neoplasm proteins, it is possible that its mechanism of action is related to these proteins. Conclusion: It is possible that Lunatin-1 represent a potential prototype to developing antitumor drugs.

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Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### SWIMMING EXERCISE INDUCES SODIUM APPETITE IN RATS

Physical exercise promotes loss of water and sodium. We investigated if chronic swimming exercise induces sodium appetite in rats. Adult male Wistar rats were submitted to swimming exercise (SE) or maintained sedentary (SED) after adaptation. Afterwards, the animals underwent daily one-hour bouts of exercise, for five consecutive days/wk, for 6 wks with 5% of body weight (b.w.) load, followed by a recovery period for 3 wks. Daily water and 0.3 M NaCl intakes were measured using drinking bottles in SE and SED rats (n=6/group). Another group of animals underwent the same SE and SED (n=6/group) procedures, but they only had access to water in the drinking bottle. Urine sodium and potassium were analyzed at the following time points: adaptation period, 3 and 6 wks of exercise, and 3 wks after recovery. Plasma sodium and potassium were evaluated in blood samples of all animals at the end of the experiment protocol. Data are expressed as mean±SEM, and statistical significance was determined with Two-way ANOVA followed by Tukey post-test (P<0.05). We observed a significant higher sodium intake in SE rats compared to SED rats after 2wks (4.6±0.7 vs. 1.1±0.4 mL/100 g of b.w.), 4wks (5.7±0.7 vs. 1.8±0.3 mL/100 g of b.w.), 5 wks (6.3±1.0 vs. 2.0±0.3 mL/100 g of b.w.), and during the 2 wks of recovery from SE bouts, without a corresponding increase in water intake. No difference was observed in water intake in rats without 0.3 M NaCl comparing SE and SED groups. Urine and plasma sodium showed no difference in all groups. Urine potassium only reduced after 6 wks of SE in rats with access to 0.3 NaCl (189.4±22.9 mEq/L) compared to SED animals (260.5±9.6 mEq/L). Our data demonstrated that SE with 5% b.w. load for 6 wks increases sodium appetite in rats, which remained higher even after the cessation of the exercise bouts, suggesting that long-term mechanisms activated by this exercise approach can mediate the change in this ingestive behavior.

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Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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### SEX DIFFERENCES OF BRAIN CHOLINERGIC ALTERATIONS RELATED TO THE ACCUMULATION OF OXIDATIVE DAMAGE DUE TO EXCESS POLYUNSATURATED FATTY ACIDS DURING DEVELOPMENT

Excess lipids can influence offspring's brain development. Excessive fatty acid supplementation may be able to modulate the protective mechanisms (NP.SH) against oxidative damage, promoting the accumulation of lipid peroxides (LPO) and disrupting the activity of cholinesterases (ChE). This study was approved by the Animal Research Ethics Committee of the Federal University of Paraná (CEUA 1303/2019) and aimed to evaluate the effect of supplementation with high doses of polyunsaturated fatty acids (PUFA) and whether there is an influence of sex on development, antioxidant defenses, and activity encephalic cholinergic. Thirty female Wistar rats were divided into 3 experimental groups: control (CTL), supplemented before mating, during pregnancy, and lactation with 4 g/kg of omega 3 (SPL3) or omega 6 (SPL6). After weaning the offspring, the animals were kept without supplementation until the day of euthanasia at 60 days of age. The brains of offspring of both sexes were used to measure the NP.SH, LPO, and ChE activity. Statistical analysis was performed in the R program (version 4.1.0), data were submitted to exploratory statistics through Principal Component Analysis. It was observed that in females, the first component represents the activity of ChE, brain weight, and LPO (variance retention = 51.7%, eigenvalue = 2.07), while in males, the first component represents the activity of ChE, LPO, and NP.SH (variance retention = 39.4%, eigenvalue = 2.13). The offspring supplemented, regardless of sex, showed high values of LPO and ChE ( $p < 0.0001$ ), while in females there was a reduction in brain weight ( $p < 0.0001$ ) and in males reduced NP.SH ( $p < 0.0001$ ). Hence, data confirms that the excessive supplementation of PUFA and its caused metabolic unbalance led to an alteration of LPO and heightened ChE activity that, in its turn, modulated reduction in brain weight in females, not males. On the other hand, in males, was observed alterations in NP.SH did not affect females.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **EFFECTS OF A LOW MOLECULAR WEIGHT PEPTIDE FRACTION FROM HARDENED BEAN (*PHASEOLUS VULGARIS*) ON THE CARDIOVASCULAR FUNCTION OF NORMOTENSIVE AND HYPERTENSIVE RATS**

Beans reached the research spotlight as a source of bioactive peptides capable of modulating physiological mechanisms. Recently, we reported antioxidant and oxidonitregic effect of a low molecular weight peptide fraction (<3kDa) from hardened bean (*Phaseolus vulgaris*) on endothelial cells and aortic rings. In this study, we evaluated the hypotensive/antihypertensive effects of this peptide fraction (PV3) in normotensive (Wistar) and spontaneously hypertensive (SHR) rats, and the mechanisms potentially involved. Methods were attempted as follows: I) Obtaining the extract and peptide fraction - bean flour was combined with a solution containing of acetonitrile, water and formic acid (25: 24: 1), and the protein extract underwent fractionation by using a 3 kDa filtration membrane. II) PV3 effects on renal vasomotion - isolated renal artery rings from WT and SHR were mounted in a Krebs-Henseleit solution, under a fixed tension (1.5 g) during 1h. Ex vivo rings were incubated with PV3 and/or with the non-selective eNOS inhibitor (L-Name) to assess the involvement of oxidonitregic pathways. PV3 effects were also tested following endothelial denudation. III) PV3 effects on hemodynamics - WT and SHR were anesthetized and prepared for measuring pressure and flow in aorta and renal arteries before and after intravenous injections of PV3 (2.5 and 5 mg/kg). IV) Dose-response hypotensive/antihypertensive effects of PV3 were also assessed. The main results of this study are: I) PV3 caused NO and endothelium-dependent

vasorelaxation in renal artery rings; II) PV3 reduced arterial pressure and this was concomitant to reductions in resistance in the aortic and renal vascular beds. III) The PV3 antihypertensive effect was evident from 5 mg/Kg. Current findings support the use of hardened beans, which would be disposed as a low commercial value product, as a source of bioactive peptides and raise the potential of composing nutraceutical formulations to treat hypertension.

*ID: 5401*

*Área: Fisiologia Geral*

*Forma de Apresentação: Ê-POSTER*

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### **MATERNAL HYPERMELATONINEMIA AND OFFSPRING METABOLIC PROGRAMMING**

Melatonin (MEL), secreted by pineal gland, influences the organism's energy metabolism controlling body weight (BW), insulin sensitivity and glucose tolerance. It also affects the physiology in a seasonal way, since the duration of its secretion profile changes throughout the seasons, being longer in winter and shorter in summer. Its seasonal secretion pattern impacts the BW, thermogenesis, and brown adipose tissue function. We evaluate the effects of MEL supplementation during gestation and lactation in the offspring development and energy metabolism. Females were treated with 0.2mg/kg/day of MEL for 35 days before pregnancy and until offspring's weaning (P21). Pups were divided into Control (C) and Melatonin (M) groups. Dams were weighted at lactation days P0, 7, 14 and 21. Offsprings' BW and food intake were measured every 3 days, from P33-90. Throughout pups' growth fur development, pinna detachment, superior incisors eruption, eye opening, testicle descent and vaginal opening were analyzed. Glucose and insulin tolerance tests were evaluated at P90. In developmental analysis, a sooner fur development was observed in M pups, suggesting that the exposure to a maternal during gestation and lactation may be a signal of seasonal preparation to colder weather. We found that M pups gained less weight from P14-21 and from P27-30 and presented lower absolute BW at P21 and P33 days when compared to C group. From P36-90, BW become statistically equal to control group. Although, food intake from P33-90 were the same in both groups, M pups presented a smaller BW immediately after weaning. GTT showed that there are no differences between groups. ITT did not present a difference in KITT, although M animals presented a plateau at 15min. In conclusion, exposure to MEL beyond physiological level during development seems to impact offspring BW, probably increasing energy expenditure, since energy intake was not altered.

*ID: 5403*

*Área: Fisiologia de Órgãos e Sistemas: Respiratória*

*Forma de Apresentação: Ê-POSTER*

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## PROTEOMIC PROFILE OF MESENCHYMAL STEM CELL AND EXTRACELLULAR VESICLE IN A HYPOXIA CONDITION

The physiological niche of bone marrow is hypoxic. However, the artificial growth of bone marrow-derived mesenchymal stromal cells (MSCs) often occurs in normoxia, which may have an impact on protein expression with immunomodulatory properties. Thus, protein profile of MSC conditioned to normoxia (MSC-Norm) and their EVs (EVs-Norm) to MSC conditioned hypoxia (MSC-Hyp) were compared, as also their EVs (EVs-Hyp), by proteomic analysis. Bone marrow MSCs were isolated from 6 male healthy Wistar rats. After achieving 80% of confluence, MSCs were submitted to normoxia (MSC-Norm, 21%O<sub>2</sub>, 5%CO<sub>2</sub>, 74%N<sub>2</sub>) or hypoxia (MSC-Hyp, 1%O<sub>2</sub>, 5%CO<sub>2</sub>, 94%N<sub>2</sub>) for 48 hours. Cell viability and oxygen consumption rate were assessed. EVs were extracted from MSCs in each condition (EV-Norm, and EV-Hyp) by ultracentrifugation. MSCs and EVs total protein were isolated and prepared for mass spectrometry. EVs were characterized by NanoSight particle-size tracking. Proteomic data were analyzed by PatternLab 4.0, STRING, GeneOntology, and Reactome software. Cell viability was higher in MSC-Hyp than MSC-Norm (p=0.007). Basal respiration (p=0.001), proton leak (p=0.004), and maximal respiration (p=0.014) were lower in MSC-Hyp than MSC-Norm, while no changes in ATP-Linked, and residual respiration were observed. 2,177 proteins were detected in MSC-Hyp and MSC-Norm, from which 147 proteins were identified only in MSC-Hyp and 512 proteins only in MSC-Norm. Furthermore, 718 proteins were identified in EV-Hyp and EV-Norm, from which 293 were detected only in EV-Hyp and 30 only in EV-Norm. Both MSC-Hyp and EV-Hyp showed enrichment of metabolic pathways and biological processes related to glycolysis, immune system and extracellular matrix organization. Therefore, since proteins involved in glycolysis, gluconeogenesis, and glucose uptake during hypoxia were upregulated, this can be linked to greater immunosuppressive properties.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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## INSIGHTS INTO THE MECHANISMS OF ESSENTIAL HYPERTENSION THROUGH GENETIC MODULATION OF AUTONOMIC BRAIN CENTRES WITH ADENOVIRUS

Essential hypertension (HT) is characterized by a deleterious sympathetic excitation leading to organ damage and increasing morbidity and mortality. It is crucial to identify brain areas of the central autonomic network responsible for this sympathetic activation that could be used as genetic therapeutic targets to control HT. The lateral parabrachial nucleus (LPBN), Kolliker-fuse (KF) nucleus and periductal grey matter (PAG) are brain regions whose role on neurogenic hypertension remains incompletely unveiled. Here, we determined the effect of genetically decreasing PAG, LPBN and KF excitability through the over-expression of hKir2.1-channels in adult male spontaneously hypertensive rats (SHR). For that, in 3 groups of animals (n=24), 1 per area, a lentiviral vector (LVV-hKir2.1;LVV) was microinjected. Blood pressure (BP), heart rate (HR), baroreflex gain (BRS), chemoreflex sensitivity (CS) and HR variability (LF and HF bands; Fisiosinal; Rev.Port.Cardiol.31:469,2012) were continuously monitored for 75 days. Student's t test and ANOVA were used (signif p<0.05). Approved by FMULEthical Committee. At 60 days post LVV microinjection into LPBN, sympathetic outflow, BP and HR decreased significantly ( $\Delta LF = -0.88 \pm 0.08 \text{ mmHg}^2 \text{ms}^{-2}$ ,  $\Delta BP = -35 \pm 1 \text{ mmHg}$ ,  $\Delta HR = -32 \pm 3 \text{ bpm}$ , respectively). In KF, a decrease in sympathetic activity and CS attenuation were seen without BP changes ( $\Delta LF = -0.38 \pm 0.38 \text{ mmHg}^2 \text{ms}^{-2}$ ).

2,  $\Delta$ Chemo =  $-27.8 \pm 0.8$  cpm). PAG silencing had no repercussions on BP, HR and sympathetic tone but decreased BRS ( $\Delta$ Baro =  $-0.27 \pm 0.02$  bpm/mmHg). No other changes occurred until the end of the monitoring period. Our results suggest a minor involvement of PAG and KF in HT whereas the decrease of LPBN excitability had a clearly input on cardiovascular variables and HT-evoked sympatho excitation. Also, we unraveled the putative contribution of areas of the midbrain and pontine autonomic network for the etiology of neurogenic hypertension and provided clues to putative future genetic therapeutic interventions to control sympatho excitation.

ID: 5406

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### LINEAR AND POLARIZED EXERCISE ARE EFFECTIVE IN MODULATING GLYCEMIC METABOLISM AND BODY ADIPOSITY IN MALE WISTAR RATS

The benefits of regular aerobic exercise practice are widely known, however, there are no studies comparing the effects of linear and polarized training on adiposity parameters and glucose metabolism in an experimental model. This study aimed to evaluate the effects of linear and polarized training on adiposity parameters and glucose metabolism in male Wistar rats. For this, 18 Wistar rats (Age: 4 months, 300-350g) were used, divided into 3 groups (6/group): Sedentary (Sed), Linear Training (LT) and Polarized Training (PT). Body mass, epididymal (EAT), subcutaneous (SAT), retroperitoneal (RAT) and mesenteric adipose tissue (MAT) and fasting glucose values were obtained. Differences were considered significant when  $p < 0.05$ . The PT group had lower body weight compared to the Sed group (Sed:  $513.8 \pm 19.40$  vs PT:  $449.7 \pm 18.8$ ). The weight of adipose tissues EAT (Sed:  $1.23 \pm 0.22$  vs LT:  $0.78 \pm 0.14$  and PT:  $0.62 \pm 0.11$ ), MAT (Sed:  $0.79 \pm 0.04$  vs LT:  $0.49 \pm 0.062$  and PT:  $0.55 \pm 0.10$ ), RAT (Sed:  $1.32 \pm 0.24$  vs LT:  $0.76 \pm 0.25$  and PT:  $0.66 \pm 0.09$ ) and SAT (Sed:  $1.73 \pm 0.18$  vs LT:  $0.89 \pm 0.17$  and PT:  $0.75 \pm 0.26$ ), were lower in the trained groups compared to the Sed group. Regarding the glucose tolerance test (GTT), the Sed group exhibited higher blood glucose throughout the test compared to the trained groups (Sed:  $174.7 \pm 14.4$  vs LT:  $148.1 \pm 8.3$  and PT:  $143.4 \pm 8.1$ ). The animals in the trained groups exhibited the lowest glycemic peak at 15 (Sed:  $277.8 \pm 3.8$  vs LT:  $254 \pm 4.9$  and PT:  $239.2 \pm 5.07$ ) and 30 minutes (Sed:  $255 \pm 2.1$  vs LT:  $192.1 \pm 4.6$  and PT:  $190 \pm 1.7$ ). The PT group exhibited lower peak of glycemia at 15 min when compared to the LT group (PT:  $239.2 \pm 5.07$  vs LT:  $254 \pm 4.9$ ), and the Sed group at 90 min (PT:  $81.2 \pm 1.3$  vs Sed:  $101.6 \pm 1.5$ ). Sed animals had a larger area under the curve compared to trained groups (Sed:  $16.5 \pm 347.2$  vs LT:  $13.6 \pm 546.0$  and PT:  $13.3 \pm 357.4$ ). Thus, the results show that both linear and polarized training were effective in improving body adiposity and glucose metabolism parameters evaluated.

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Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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## THE IMPACT OF COVID-19 ON SCIENTIFIC PUBLICATIONS IN THE FIELD OF PHYSIOLOGY TEACHING

Since the outbreak of the coronavirus disease 2019 (COVID-19) pandemic in 2020, most physiology courses have shifted from in-person to remote teaching. What has been the impact of such changes on scientific publications on physiology teaching more than a year after the onset of the pandemic? To answer this question, we performed a systematic review of the literature in ERIC and Google Scholar databases using the terms "physiology" AND "teaching" AND "COVID". The search identified 90 articles. Inclusion criteria were full-text original articles addressing the teaching of human physiology published in English between 2020 and 2021. Duplicates (n = 61) were excluded, resulting in 29 relevant articles. These studies reflect the continuity of research on physiology teaching during the COVID-19 pandemic, mainly with the purpose of sharing successful experiences between professors. There was some initial hesitation regarding remote lessons, given that physiology teaching traditionally relies on laboratory practices, which have had to be replaced by digital experiments (Adv. Physiol. Educ. 44: 579, 2020; Adv. Physiol. Educ. 45: 95, 2021). Another concern identified was related to student engagement and performance in remote environments compared with traditional teaching models (Adv. Physiol. Educ. 45: 37, 2021; Adv. Physiol. Educ. 45: 310, 2021). Even though there was a preference for the face-to-face format, online models showed satisfactory performance in the teaching-learning process (Adv. Physiol. Educ. 45: 31-33, 2021). Different methodological strategies were adopted to ensure the continuity of physiology teaching during the pandemic, all of which were focused on student learning. In conclusion, the transition to online education was positive, evidenced by the enthusiasm shown by educators in facing adversity, which suggests that the challenges brought by the pandemic resulted in changed perspectives at this atypical moment.

ID: 5408

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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## WATER-SOLUBLE PM<sub>2.5</sub> LEADS TO FOAM CELLS FORMATION BY INDUCING AN OXIDANT PHENOTYPE BY MACROPHAGES

The exposure to fine particulate matter (PM<sub>0.1-2.5</sub>µm), an air pollutant, enhances the susceptibility to atherosclerosis. It leads macrophages to mitochondrial dysfunction and increases ROS and RNS generation, both related to LDL oxidation. The phagocytosis of oxLDL by macrophages is a key step in the foam cells formation and atherosclerosis development. Although the most studied effects of PM<sub>2.5</sub> were associated with the transition metals present in its particles, the effects of its water-soluble fraction remain unclear. We hereby investigated if the water-soluble PM<sub>2.5</sub> could lead to foam cells formation. We partially extracted PM<sub>2.5</sub> retained in glass fiber filters in PBS and centrifuged at 1000 xg for 15 min. This solution (1 g filter/125 mL PBS) was diluted in DMEM 10% FBS ten (PM<sub>10X</sub>) and a hundred times (PM<sub>100X</sub>). We exposed RAW264.7 mouse macrophages cell line to PM<sub>100x</sub> and PM<sub>10x</sub> for 48 h, and used PBS as a Control. ROS, nitric oxide (NO) and conjugated dienes were evaluated by spectrophotometry. To evaluate the foam cell formation, we exposed these cells to PM<sub>2.5</sub> for 48 h and added nLDL in the last 24 h, stained lipid droplets with AdipoRed and analyzed it by fluorescence microscopy. Data expressed in mean ± SD, One-Way or RM Two-way ANOVA, followed by Tukey. PM<sub>2.5</sub> activated macrophages, by increasing ROS [Ctrl:0.97±0.21; PM<sub>100X</sub>:1.32±0.46\*; PM<sub>10X</sub>:1.55±0.66\*, P=0.0008 \* vs Ctrl] and NO production, with a dose-dependent effect [Ctrl:1.00±0.11; PM<sub>100X</sub>:1.36±0.24\*; PM<sub>10X</sub>:1.85±0.57\*,

P<0.0001\* vs all groups]. We further evaluated if the PM2.5-conditioned medium could oxidize LDL, by measuring conjugated dienes, a subproduct of LDL oxidation. PM2.5 enhanced the formation of conjugated dienes [Treatment: P=0.0004\*; Time: P<0.0001; Interaction: P=0.99]. Finally, fluorescence images showed that PM2.5 exacerbated the lipid deposition. Therefore, we conclude that water-soluble PM2.5 exacerbates the foam cells formation, by promoting an oxidative milieu and oxidizing LDL.

ID: 5409

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### ANALYSIS OF OXIDATIVE STRESS IN NEURAL AND MUSCLE TISSUE AFTER CONCURRENT TRAINING IN FEMALE RATS IN THE PERIOD OF SENESCENCE

This study aimed to evaluate the influence of regular concurrent training on the redox mechanism in the skeletal muscle, plasma and hippocampus of senescent rats. Rats in periostropause (17 – 21 months) and adhering to physical exercise were distributed in untrained groups (NT; n = 10) and in the concurrent training group (CT; n = 10). For 4 months, the rats underwent CT three times a week being resistance training (RT) followed by aerobic training (AT), the maximum voluntary load capacity test (CCVM) and incremental maximum speed test (TIVM) were applied to adjust loads and speed during the training period. We observed that regular physical exercise led to gains in muscle strength and improved VO<sub>2</sub> maximal, greater lipid oxidative damage, non-enzymatic (GSH) and enzymatic (CAT) antioxidant defense in the hippocampus of experimental animals compared to the control group. In addition, the CT triggered a decrease in TBARS and an increase in antioxidant defense in the gastrocnemius muscle (FRAP; SOD) and in the plasma (GSH; SOD; CAT). The rats that participated in the CT showed oxidative damage repair and enzymatic and non-enzymatic antioxidant protection in the tissues analyzed, in addition to improved muscle quality and functional skills.

ID: 5411

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### AEROBIC TRAINING IN THE HEAT PROMOTES SIMILAR EFFECTS TO TEMPERATE ENVIROMENT ON MUSCLE MASS, BLOOD LACTATE AND PERFORMANCE

Although heat (H) acclimation (≤4wk) improves performance in H, its effects for longer periods (≥8wk) are unknown. This study aimed to characterize the long-term adaptations of skeletal muscle and adipose

tissues and aerobic exercise capacity in a novel murine model of running training in the H. Adult, male Swiss mice were divided in: 1) Sedentary (SED) mice kept in the temperate (T) environment (22°C; SED/T), 2) SED kept in H (32°C; SED/H), 3) mice trained (TRA) in treadmill (1h/day, 5 days/wk, 8wk, 60% of maximum speed (S<sub>max</sub>) in T (TRA/T), and 4) TRA in H (TRA/H). All groups performed incremental load tests in T and H before (pre-training) and after 4 and 8wk of training. In pre-training period, H impaired performance by reducing ~30% performance parameters (TTF, S<sub>max</sub>, distance and workload) and increased (+2°C) maximum abdominal body temperature (ABT<sub>max</sub>) in TRA/H vs. TRA/T. In T, after 4wk, although TRA/H exercised at a lower (26%) absolute intensity than TRA/T, performance parameters (except TTF) were similarly increased in both TRA groups compared with SED/T. After 8wk, performance parameters (except S<sub>max</sub>) were also higher in both TRA groups compared with SED/T. In H, only after 8 weeks, both TRA groups improved ~19% performance parameters (except workload) and reduced ~46% posttest blood lactate levels compared to their respective pre-training values. TRA/T increased (~8%) the mass of triceps sural and EDL muscles relative to body mass and reduced (~30%) the relative mass of retroperitoneal (RET) and subcutaneous adipose (SA) tissues. TRA/H reduced (~20%) the relative mass of mesenteric adipose tissue. Glycaemia post-test was unaffected in any group in T and H. Our findings indicate that TRA in H, even performed in lower absolute intensity, promotes similar effects of T on muscle mass, lactate and performance, but different adaptations in adipose tissue.

ID: 5412

Área: *Fisiologia Geral*

Forma de Apresentação: *Ê-POSTER*

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### **DIETARY POLYPHENOLS FOR KIDNEY PROTECTION: CONTRIBUTING TO THE PHYSIOLOGICAL RELEVANCE OF IN VITRO STUDIES**

Polyphenols are broadly present in plants and are included in the human diet through fruits, vegetables, cereals and plant-derived beverages. Numerous studies have highlighted the relevance of polyphenol consumption in health and reported their protective effects against a wide range of pathologies, including kidney diseases like chronic kidney disease, diabetic nephropathy, or renal cancer. Many of these studies, particularly those dealing with molecular mechanisms are based on in vitro models where dietary polyphenols are directly incubated with kidney cells. Besides the limited predictive value of in vitro methodologies, the physiological relevance of this approach is further compromised by not considering the extensive in vivo metabolism of polyphenols. Upon ingestion, polyphenols undergo a series of metabolic processes driven by the liver and/or the gut microbiota, that originate different low-molecular weight phenolic metabolites (PM). As far as kidney is concerned, available data on the urinary excretion of PM provides crucial information on the exact compounds that contact with kidney tissues. This work aims to provide a basis to increase the physiological relevance of in vitro studies dealing with the impact of polyphenols in kidney, by identifying the physiologically relevant compounds and concentrations. For this purpose, scientific publications, as well as the PhenolExplorer and PhytoHub databases were used to identify the PM excreted in urine and to estimate their maximum urinary concentration. We selected 34 distinct PM that have been identified in human urine, after diet or supplementation intervention, in concentrations varying between 1 and 400 µM. This study provides a basis for the selection of physiological Relevant compounds and concentrations that should be considered in the design of in vitro studies addressing the effects of polyphenols intake on renal health.

ID: 5413

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **PROTEIN KINASE D1 (PKD1) REGULATES INTRACELLULAR Ca<sup>2+</sup> SIGNALING TO ANGIOTENSIN II IN VENTRICULAR CARDIOMYOCYTES**

The role of protein kinase D1 (PKD1) on the myocardial contractility regulation is still poorly understood. The aim of this study is to verify the participation of PKD1 on the Ca<sup>2+</sup> signaling, angiotensin II, aldosterone and isoproterenol induced. Ventricular cardiomyocytes were isolated from male mice wild WT and cardiac-specific PKD1KO (knockout) (UCDavis Ethics Committee #19279). We evaluated the cytosolic and nuclear Ca<sup>2+</sup> transients and myocardial contractility (electrical stimulation 0.5Hz, 30V, 2ms, Intracellular indicator of Ca<sup>2+</sup> Fluo-4AM) from cardiomyocytes treated with: angiotensin II (100 nM 1 to 5 min), aldosterone (100 nM/5 min, n=8) and isoproterenol (100 nM/1min, n=8). The following parameters were evaluated: Ca<sup>2+</sup> transient (F/F<sub>0</sub>), time to peak (TTP, ms) and decay time to 50% of the peak value (TD50, ms). Myocardial contractility was measured through edge detection. Sparks were analyzed using the Spark Master program. Statistical analysis: test t-Student/ANOVA one-way. The cytosolic Ca<sup>2+</sup> amplitude was greater than the nuclear amplitude in both groups. The cardiomyocyte rate of shortening was similar between groups in the presence of angiotensin II, aldosterone and isoproterenol. However, angiotensin II increased cytosolic Ca<sup>2+</sup> only in the WT group without modifying the cardiomyocytes shortening. None of the drugs were able to modify nuclear Ca<sup>2+</sup>, TTP or TD50 in both groups. Angiotensin II binds to stimulatory G protein (Gs), which causes activation of adenylate cyclase, and subsequently stimulates the production of DAG and IP<sub>3</sub>, which are bound to protein kinase C (PKC), and consequently trigger changes in the intracellular Ca<sup>2+</sup> cycle. In the present study, we demonstrate that this pathway depends on PKD activation. The study demonstrated that cardiac PKD1 participates in the acute regulation of cytosolic Ca<sup>2+</sup>, mediated by angiotensin II, but not by aldosterone and isoproterenol. This increase in cytosolic Ca<sup>2+</sup> did not change myocardial contractility.

ID: 5414

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **BRAIN-DERIVED NEUROTROPHIC FACTOR (BDNF) DOES NOT REPRODUCE THE DEPOLARIZATION INDUCED BY LOW GLUCOSE ON NEURONS FROM THE NUCLEUS OF THE SOLITARY TRACT (NTS) FROM RATS**

Glucose is the main source of energy in the CNS, and the dysregulation of its blood levels is related to serious health problems. The body produces compensatory responses to hypoglycaemia in order to restore normal levels called the counter-regulatory response to hypoglycaemia and the NTS is

one of the areas of the CNS that mediate this response. Some studies showed that BDNF induces a hyperglycaemic response in vivo, while the inhibition of its TrkB receptor had the opposite effect. In vitro studies have shown an inhibitory effect on TS-evoked glutamatergic excitatory AMPA currents. Recently we demonstrated that perfusing brainstem slices with a low-glucose solution depolarizes NTS neurons, by an unknown mechanism. Here we tested the hypothesis that BDNF could be participate in this effect. For this we used whole-cell patch-clamp technique in brainstem slices from Wistar rats with 21 - 42 days old (CEUA-FMRP protocol number 189/2020) containing the subpostremal NTS in the presence of synaptic blockers. From a glucose concentration of 5 mM, changing to a solution with 0.5 mM glucose induced a depolarization of  $11.3 \pm 3.5$  mV. In voltage-clamp, low-glucose induces an inward current with a reversal potential of  $39 \pm 18$  mV. In addition, there was a decrease in action potential (AP) threshold and an increase AP frequency. On the other hand, BDNF (100 ng/ml), did not produce a significant depolarization ( $1.14 \pm 0.47$  mV) and did not change the membrane current in NTS neurons. BDNF did not change AP firing, although it decreased the AP threshold in  $-2.7 \pm 0.6$  mV. We conclude that BDNF does not mediate the effects of low glucose seen in NTS neurons.

ID: 5415

Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

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### **BENEFICIAL EFFECTS OF PHYSICAL EXERCISE ON PANCREATIC EXPRESSION OF INFLAMMATORY, OXIDATIVE AND APOPTOTIC MARKERS IN MODEL OF STREPTOZOTOCIN-INDUCED DIABETES IN FEMALE RATS**

The mechanisms by which exercise promotes its beneficial effects in the pancreas have not yet been fully elucidated in type 1 diabetes mellitus. This study investigated the effects of exercise on expression of inflammatory, oxidative and apoptotic markers and insulin in the pancreas of diabetic female rats. Thirty female Wistar rats, weighing between 200 and 250 g, were divided into 5 groups: C+Se (sedentary control, n=6), C+Ex (trained control, n=6), D+Se (sedentary diabetic, n=6), D+Ex (trained diabetic, n=6) and D+PEX (previously trained diabetic, n=6). Only the D+PEX group was submitted to 4 weeks of exercise before the induction of diabetes by streptozotocin (40 mg/kg, iv). After confirming of diabetes, the D+PEX, D+Ex and C+Ex groups were submitted to 8 weeks of exercise. Pancreatic tissue was collected for studies of oxidative/nitrative stress, immunohistochemical, ELISA and Western Blot. The experimental protocol was analyzed and approved by CEUA (UFBA/IMS) (Protocol nº 052/2017). Only the D+PEX group had increased insulin and IL-6 expression and reduced NRF2 in the pancreas compared to the D+Se group,  $p < 0.05$ . Both exercise protocols reduced the lipid peroxidation and expression of nitrotyrosine, catalase, nitrites and TNF- $\alpha$  in the pancreas of D+Ex and D+PEX groups compared to the D+Se group,  $p < 0.001$ . Exercise also reduced apoptosis in D+Ex and D+PEX groups,  $p < 0.01$ . Only the D+Ex group improved the expression of SIRT1,  $p < 0.01$ . All diabetic animals showed increased expression of heme-oxygenase1 compared to control groups,  $p < 0.05$ . Our data demonstrate that moderate exercise promoted beneficial effects in the pancreas by reducing lipid peroxidation, inflammatory process and apoptosis in female rats with type 1 diabetes.

ID: 5416

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### EFFECTS OF PREVENTIVE AND THERAPEUTIC AEROBIC TRAINING ON THE GENE EXPRESSION OF CYTOKINES IN PRIMARY MACROPHAGES TREATED WITH SERUM OF AGED AND OBESE RATS

In vitro essays are promising method to investigate the systemic effects of physical training. In this context, the present study aimed to evaluate the gene expression of inflammatory-related cytokines from macrophages exposed to serum of trained and untrained aged and obese rats. Serum was collected from 32 male Wistar rats (300-350g, initial age=4 months, final age=14 months) allocated into 4 groups (8/group): aged sedentary (ASed), aged sedentary fed a high-fat diet (HFD) (ASed+HFD), aged therapeutically trained (i.e., trained after HFD) and fed a HFD (ATT+HFD) and aged preventively trained (i.e., trained before and after HFD) and fed a HFD (APT+HFD). Animals trained in a treadmill, at moderate intensity for 60 min., and in alternate days. Macrophages were obtained from 6 male BALB/c mice, 20-25g. Cells was exposed to fetal bovine serum (FBS) alone or added with 10% rat serum from each rat group. Hydrogen peroxide ( $H_2O_2$ ), nitrites and the gene expression of TNF- $\alpha$ , IL-1 $\beta$  and IL-10 were measured 24 h after exposure. ANOVA one-way was used to group comparison with significance level set as  $p < 0.05$ . This study was approved by the IMS-UFBA CEUA (protocol 079/2020). Compared to the ASed, ASed+HFD showed greater  $H_2O_2$  ( $6.56 \pm 1.37$  vs  $2.69 \pm 0.48$ ), nitrite ( $9.12 \pm 0.41$  vs  $6.86 \pm 0.78$ ), and upregulation of TNF- $\alpha$  ( $8.01 \pm 2.85$  vs  $2.26 \pm 0.68$ ) and IL-1 $\beta$  ( $4.14 \pm 0.96$  vs  $1.28 \pm 0.55$ ) gene expression, while cells treated with trained rats' serum showed upregulation of IL-10 (ATT+HFD:  $2.07 \pm 0.44$ ; APT+HFD:  $4.12 \pm 0.59$  vs  $0.98 \pm 0.26$ ) gene expression. Only APT+HFD showed lower  $H_2O_2$  ( $3.89 \pm 0.60$  vs  $6.56 \pm 1.37$ ), nitrite ( $7.31 \pm 0.65$  vs  $9.12 \pm 0.41$ ) and downregulation of TNF- $\alpha$  ( $4.08 \pm 0.62$  vs  $8.01 \pm 2.85$ ) and IL-1 $\beta$  ( $2.52 \pm 0.27$  vs  $4.14 \pm 0.96$ ) gene expression. Serum from aged and obese animals induced a harmful pro-inflammatory profile in macrophages, while the serum from trained animals attenuated this profile. Preventive training induced a better inflammatory profile, when compared to the therapeutic training.

ID: 5417

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### PROTEIN KINASE D1 (PKD1) SIGNALING INVOLVEMENT IN THE VASCULAR REACTIVITY IN SPONTANEOUS HYPERTENSIVE RATS

INTRODUCTION: Arterial hypertension (AH) is a multifactorial disease involving changes in vascular

reactivity. Although blood vessels are known to express the protein kinase D1 enzyme (PKD1), their role in regulating vascular reactivity in AH isn't clear. The objective of this study was to evaluate the participation of the PKD1 signaling pathway in vascular reactivity in spontaneous hypertensive rats (SHR). METHODS: Twenty male SHR, 3 months old, weighing  $257 \pm 4.5$ g, were used. The vascular reactivity of thoracic aortic rings, pre-contracted with 75mM KCl, was evaluated in the concentration-response curves to phenylephrine and angiotensin II, in the presence of the selective PKD1 inhibitor, CID  $3.2 \mu\text{M}$ ; L-NAME  $100 \mu\text{M}$ , non-selective inhibitor of the nitric oxide synthase (NOS); 1400W  $1 \mu\text{M}$  compound, selective iNOS inhibitor; N- $\omega$ -hydrochloride-propyl-L-arginine  $0.5 \mu\text{M}$ , selective nNOS inhibitor (CEUA-Ufes 02/2020). The statistical analysis used was one-way ANOVA plus Tukey's post hoc. RESULTS: In the presence of intact vascular endothelium, CID reduced the vasoconstriction phenylephrine-induced, but didn't modify the response to angiotensin II. However, the angiotensin II-dependent contraction increment, during endothelium removal (E-), was smaller in the presence of CID (Angiotensin  $10^{-5}\text{M}$ :  $E=137.0 \pm 13\%$  vs  $E\text{-CID}=89.9 \pm 3.3\%*$  to KCl 75mM,  $*p < 0.01$ ). Perfusion with L-NAME prevented the reduction of the vasoconstriction induced by CID (Phenylephrine  $10^{-3.5}\text{M}$ : Control= $116.6 \pm 13.5\%$ ; CID= $60.0 \pm 14.5\%*$ ; L-NAME= $138.9 \pm 14.6\%$ ; L-NAME+CID= $116.3 \pm 13.9\%$  to KCl 75mM,  $*p < 0.01$ ). PKD1 inhibition reduced the increment in the contractile angiotensin II-dependent, during nNOS inhibition (N- $\omega$ -hydrochloride-propyl-L-arginine= $68.0 \pm 9.9\%$  vs N- $\omega$ -hydrochloride-propyl-L-arginine+CID= $42.1 \pm 8.8\%$  to KCl 75mM,  $*p < 0.01$ ). CONCLUSION: This result suggests that PKD1 signaling is involved in the vascular reactivity to  $\alpha$ -adrenergic and angiotensin II receptors, depending on the vascular NO bioavailability in the SHR animals.

ID: 5419

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual de Maringá (UEM-PR)

### **EFFECT OF PROTEICO-CALORIC RESTRICTION DURING LACTATION ON BIOMETRIC AND METABOLIC PARAMETERS OF FEMALE WISTAR RATS IN ADULT LIFE**

Currently, the experimental study of nutritional insults such as protein restriction and its effects are considered key tools to understand metabolic programming and the DOHaD concept. In this way, lactation make up a window of susceptibility to metabolic programming, once in rodents the development and maturation of the major organs and tissues, such as the endocrine system, occurs mainly during the first weeks after birth. Male adult offspring protein restricted at lactation showed a lean phenotype associated to glucose metabolism imbalance. Therefore, we hypothesized that maternal protein restriction during lactation causes a lean phenotype associated to metabolic dysfunctions in female adult offspring. At birth, dams were divided in two groups: NP, normal protein diet through lactation (n=3 litters, 20.5% protein) and LP, low-protein diet during the first two weeks of lactation (n=3 litters, 4% protein), ethical approval n° 8625310521. At 90 days of life, female offspring were submitted to intravenous glucose tolerance test (ivGTT), intraperitoneal insulin tolerance test (ipITT) and euthanasia. We observed a lower AUC body weight (22%, NP= $12382 \pm 229$ ; LP= $9652 \pm 187$ ,  $p < 0.0001$ ) associated to increased relative food intake (19%, NP= $666 \pm 8$ ; LP= $796 \pm 9$ ,  $P < 0.0005$ ) in LP group. Retroperitoneal, mesenteric, periovarian and periuterin fat pads were decreased in LP animals by approximately 26% (NP= $0.8 \pm 0.07$ ; LP= $0.5 \pm 0.04$ ,  $p < 0.0001$ ), (NP= $0.6 \pm 0.04$ ; LP= $0.5 \pm 0.03$ ,  $p < 0.05$ ), (NP= $0.8 \pm 0.04$ ; LP= $0.5 \pm 0.5$ ,  $p < 0.01$ ) (NP= $0.9 \pm 0.09$ ; LP= $0.6 \pm 0.07$ ,  $p < 0.01$ ) respectively. Interestingly, LP group demonstrated normal

glucose levels at ivGTT (NP=5132±144; LP=5543±324, p=0.2) and no difference in insulin sensitivity, as demonstrated by Kitt (NP=1.8±0.2; LP=1.9±0.15, p=0.8). In conclusion, low-protein diet at lactation brought significant biometric modifications, mainly a lean phenotype, to adult female offspring, without alterations on glucose metabolism parameters, showing a sexual dimorphism.

ID: 5420

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual de Maringá (UEM-PR)

### NON-SWEETENING FRACTION OF STEVIA REBAUDIANA LEAVES ATTENUATES STREPTOZOTOCIN DIABETOGENIC EFFECTS IN RATS

*Stevia rebaudiana* is a plant commercially explored to obtain non-caloric sweeteners, derived from the steviol glycosides extracted from stevia leaves. Also, stevia extracts contain more than 100 compounds that can be separated by different fractionation methods. The ethyl acetate fraction (FAE) is sweeteners glycosides free, has high protein contents and phenolic compounds. This fraction has insulinotropic effects in high glucose concentrations, a relevant feature of your possible clinical application. Therefore, we aimed to evaluate the effects of FAE treatment on diabetic rats. All experimental protocol was approved by the local Ethics Committee on Animal Use and Care (n° 9076141116). Thirty-days-old male Wistar rats (n = 15) were treated with FAE (5 mg/kg; v.o.) until 90-days-old. At 60-days-old, rats received streptozotocin (40mg/kg p.c.; i.v.) to induce diabetes. A diabetic control group (n = 15) was submitted at the same experimental conditions but received only water. After euthanasia, blood samples, pancreas and liver were collected and properly stored. The insulinemia of treated group (STZ+FAE) ( $0.054 \pm 0.02$  ng/mL) was about 60% higher ( $p < 0.01$ ) compared to control group (STZ) ( $0.022 \pm 0.01$  ng/mL). The STZ+FAE group ( $12463 \pm 1538 \mu\text{m}^2$ ) displayed larger pancreatic islets area (~40%) ( $p < 0.001$ ) than the STZ group ( $6967 \pm 1319 \mu\text{m}^2$ ). The expression of IDE ( $1.13 \pm 0.18$  vs  $1.44 \pm 0.19$ ;  $p < 0.05$ ) and CEACAM1 ( $1.12 \pm 0.1$  vs  $1.63 \pm 0.16$ ;  $p < 0.001$ ) was significantly reduced in the liver from STZ+FAE compared with STZ group. In conclusion, rats treated with FAE, before and after the diabetes induction, had improved insulinemia probably because it mitigate the streptozotocin diabetogenic effects, by preserving pancreatic islets area and, possibly, by reducing hepatic insulin clearance.

ID: 5421

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual do Ceará (UECE)

## OXYTOCIN INHIBITS NHE3 ACTIVITY IN RENAL PROXIMAL TUBULE: IMPACT OF VASOPRESSIN ASSOCIATION

Oxytocin (OT) and vasopressin (AVP) are nonapeptides that participate in hormonal regulation of blood pressure in response to changes in volume and osmolarity. Renal effects of increased natriuresis and diuresis promoted by OT have been described, but not fully elucidated. Considering that the renal proximal tubule reabsorbs almost 65% of filtered sodium, this study aimed to investigate the effects of oxytocin in proximal sodium reabsorption, especially on NHE3 activity, which is responsible for two thirds of proximal sodium reabsorption. The experimental protocol was previously submitted and approved by the Ethics Committee for Use of Animals at State University of Ceará (00859693/2019). We used male Wistar rats, 3 months old, weighing between 250-320g. In order to evaluate NHE3 activity, we used the stationary in vivo renal microperfusion method. This technique represents an indirect measure of proximal bicarbonate reabsorption, that is mediated around 80% by NHE3 activity. Our findings have demonstrated that in OT  $10^{-9}$ , OT  $10^{-10}$  and OT  $10^{-11}$  M groups there was a significant decrease in the net of bicarbonate reabsorption (J  $\text{HCO}_3^-$  nmol/cm<sup>2</sup>.s):  $1.38 \pm 0.05$  (16);  $1.46 \pm 0.10$  (7);  $1.62 \pm 0.05$  (10), respectively, when compared to the control group:  $2.18 \pm 0.06$  (6) ( $p < 0.05$ ). We perfused proximal segments with OT and  $10^{-4}$  M EIPA (Ethylisopropyl Amiloride), an NHE inhibitor. There was no additional inhibition on bicarbonate reabsorption net promoted by OT in the presence of EIPA [EIPA  $10^{-4}$  M ( $1.45 \pm 0.07$  (12)); EIPA  $10^{-4}$  M + OT  $10^{-9}$  M ( $1.42 \pm 0.09$  (10))]. These findings indicate that OT inhibits proximal bicarbonate reabsorption by NHE3 modulation. In the presence of AVP  $10^{-9}$  M, the inhibitory effect on NHE3 activity promoted by OT  $10^{-9}$  M was abolished [OT  $10^{-9}$  M + AVP  $10^{-9}$  M ( $2.15 \pm 0.06$  (11)) x OT  $10^{-9}$  M group ( $1.38 \pm 0.05$  (16)), ( $p < 0.05$ )]. Our results indicate that OT inhibits NHE3 activity in rat renal proximal tubule and this effect is abolished by AVP.

ID: 5422

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## HEMORRHAGE, HYPOXIA AND NEUROINFLAMMATION PRECEDES MICROGYRIA MALFORMATION IN THE NEONATAL FREEZE LESION MOUSE MODEL

Microgyria it is a cortical malformation that leads to hyperexcitability, epilepsy and global development delay. Although case studies have shown that microgyria can occur due to local perfusion failure, leading to ischemia/hypoxia, but this hypothesis has never been directly tested. This hypoxia would lead to necrosis of preformed cortical layers, with subsequent migration of neuroblasts that would form superficial layers. Focal transcranial freezing lesion on day 1 of birth in mice mimics microgyria, inducing tissue necrosis and death of differentiated neuroblasts in layers IV, V and VI. Undifferentiated neuroblasts migrate, not trespassing the necrotic zone, which generates a sulcus in the cortical plate. This study aims to test whether the microgyria model by focal freezing injury induces hemorrhages, inflammation and vascular changes that can lead to hypoxia of the newly formed cortex. For this purpose, we performed a focal lesion in the visual cortex by freezing in a mouse of the Swiss strain at the day of birth (P1). Animals were euthanized 4 hours, 3 and 15 days after injury. To check for hemorrhages, we performed histochemistry for peroxidase activity. Neutrophils were identified by LY6G

immunohistochemistry. Hypoxia was verified by immunohistochemistry against HIF-1 alpha. Statistical analyses were performed using paired Student-T test, with statistical significance when  $p < 0.05$ . Was observed a significant increase compared to the contralateral side for hemorrhage, HIF-alpha and LYG-6 labeling in 4 hours after the lesion (P1). This marking is reduced after 15 days, but remains higher on the side of the lesion compared to the control side. These results suggest that vascular damage occurs as a result of the injury, leading to hemorrhages and subsequent inflammatory activation. This discontinuity of the vessels promotes hypoxia of the region previously vascularized, inducing neuronal death characteristic of microgyria.

ID: 5424

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual de Londrina (UEL-PR)

#### **METABOLIC AND REPRODUCTIVE PARAMETERS IN THE OFFSPRING OF FEMALE RATS WITH POSTNATAL UNDERNUTRITION INDUCED BY EXPANSION OF LITTER SIZE**

Nutritional experiences in the early period of life can induce metabolic and reproductive changes throughout adult life, and in the next generations. The effects of malnutrition in the early stages of life are still controversial, considering variables such as the degree and duration of caloric restriction. The expansion of litter size is one of experimental model used to induce early malnutrition. The aim of this study was to investigate if neonatal undernutrition in female rats, induced by expansion of litter size, promotes changes on metabolic and reproductive parameters in their male and female offspring. For this, body weight, food intake, vaginal opening, first estrus, estrous cyclicity, preputial separation for males, Glucose Tolerance Test (GTT), Lee index, plasma levels of total cholesterol levels, triglycerides, free fatty acids, testosterone, and estradiol, as well as the weights of white adipose tissue, testicles, ovaries, uterus and adrenals were evaluated in the adult male and female offspring of female rats raised in normal (NL: 10 pups-5 males and 5 females) and large (LL: 16 pups-8 males and 8 females) litters. The procedures were approved by Ethics Committee for Animal Use of the State University of Londrina-UEL, Protocol 18310.2019.03. Male and female offspring of LL female rats showed lower ( $p < 0.05$ ) body weight gain, but higher ( $p < 0.05$ ) food intake than offspring of NL. Male offspring of LL mothers presented higher ( $p < 0.05$ ) nasoanal distance, lower ( $p < 0.05$ ) Lee index and glycemia after 15 and 30 minutes of glucose overload, as well decreased ( $p < 0.05$ ) area under the curve of GTT, compared to male offspring of NL mothers. No significant differences were observed on the other evaluated parameters. Thus, neonatal undernutrition in female rats predispose their male and female offspring to develop metabolic changes, without reproductive repercussions, indicating that maternal undernutrition may affect the development of the offspring.

ID: 5426

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **EFFECT OF SUPPLEMENTATION WITH KEFIR DURING GESTATION ON EVOLUTION OF BODY WEIGHT OF THE OFFSPRING OF MOTHERS FED WITH WESTERN DIET**

Obesity is characterized by the excessive accumulation of body fat that produces the deleterious effects of the individual's health and can generate several interferences for the fetus gestated in the obesogenic environment. Strategies can be used to reduce interferences in the offspring such as probiotic supplementation during pregnancy, highlighting Kefir (K), a grain complex that acts modulating the intestinal microbiota. Our goal was to test whether probiotic intervention during gestation in an obesogenic environment generates changes in the offspring's body weight in the wean, from a randomized clinical study conducted with 35 Wistar rats and its litter. During ~ 2 months the animals were exposed to dietary intervention (standard diet - SD and Western diet - WD) and at 80 days of life placed to mate and subdivided for supplementing with 3ML of K or 3ML of pasteurized milk (M) in gestation, by gavage. At birth, the litter was standardized (8 animals) and had its weight accompanied in alternate days until the 21st day (wean). The results were compared by the tests Student's t-test, ANOVA, Tukey test and expressed as mean  $\pm$  standard deviation, analyzing data from 264 rat babies (SD+M n= 71; SD+K n= 63; WD+M n= 57; WD+K n= 73). The WD caused a reduction of  $6.356g \pm 0.5425$  ( $p \leq 0.0001$ ) in the overall weight of the offspring on the day of the wean, and the supplementation with K attenuated the low weight when compared to the group M (K=  $\bar{X} 35.91g$ ; M=  $\bar{X} 31.57g$ ), both exposed to WD. There was no significant difference in weight in the SD-fed group, regardless of the intervention ( $\bar{X} 40.36g$ ). The result indicates that supplementation with K is capable of giving nutritional deficiency generated by the obesogenic state in pregnancy, since a greater gestational weight is associated with low birth weight, and may directly influence the obesity of adult life, concluding that probiotic supplementation may be a viable therapeutic approach to interrupting the cascade of adiposity.

ID: 5427

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER*

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### **RAT RENAL PROXIMAL TUBULE NHE3 MODULATION BY ESTRADIOL AND PROGESTERONE**

Estradiol (E2) and progesterone (P4) are two of the major steroid hormones involved in the control of reproductive functions in females. The aims of the present study are to investigate the acute and chronic (10 days) effects of E2 and P4 on NHE3 activity in kidneys of control (sham) or ovariectomized rats (OVX). All the protocols were approved by the Committee on Animal Research and Ethics from the Ceara State University (2722214/2016). The estrous cycle of female Wistar rats, 3 months old, weighing between 250-320g, were evaluated during 15 days and animals randomly assigned to OVX or sham group. Thereafter, two weeks after surgery, the activity of NHE3 was evaluated in vivo by using the stationary microperfusion technique and after this procedure, the kidneys were stored for evaluation of NHE3 protein abundance by Western Blot. It was observed that OVX presented lower H+

secretory activity than all cyclic groups and the estrous group presented higher secretion rates [JHCO3-nmol.cm-2.s-1: OVX 1.74±0.07(10); Proestrus 1.90±0.12(12)a; Estrus 2.35±0.08(13)ab; Metaestrus 1.97±0.12(15)ac and Diestrus 1.89±0.08(14)ac, where a p<0.05 vs OVX, b p<0.05 vs Proestrus and c p<0.05 vs Estrus]. An increase in proximal H<sup>+</sup> secretion/bicarbonate reabsorption was observed in all E2 and P4 concentrations when administered intratubularly and compared to the OVX group [JHCO3-: OVX+Vehicle 1.84±0.06(11); E2(0.1nM) 2.18±0.07(15)a; E2(1nM) 2.24±0.08(11)a; E2(10nM) 2.20±0.09(12)a; P4(0.1nM) 2.18±0.11(13)a, P4(10nM) 2.10±0.07(10)a, where a p<0.05 vs OVX + Vehicle]. The chronic administration of E2 also promoted a stimulatory effect on NHE3 [JHCO3-: control 5.20±0.30(3) x E2 5.58±0.15(13), (p<0.05)]. However, there was no difference on NHE3 activity from rats treated with P4 when compared to the control [JHCO3-: control 5.20±0.30(13) x P4 5.43±0.27(18), (p>0.05)]. Significant changes in NHE3 activity occurs in the different phases of estrous cycles.

ID: 5429

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## TRANSCRIPTOME PLASTICITY OF THE DORSAL RAPHE AND ARCUATE NUCLEUS IN RESPONSE TO FASTING

The neuroendocrine regulation of hunger is very important to the body's energy balance since its dysregulation can cause eating disorders. Two of the main brain cores related to the regulation of food intake are the Arcuate (ARC) and Dorsal Raphe Nucleus (DRN). The ARC is well known for its response to gastrointestinal tract and adipose tissue hormones (i.e. ghrelin, insulin, and leptin) that regulate Npy/Agrp and Pomc/Cartpt expression neurons to induce hunger or satiety, respectively. Alternatively, the DRN, the main nucleus responsible for produce and release serotonin in the brain, is deeply involved in satiety development and mood regulation. Thus, by exploring the ARC and DRN transcriptomic plasticity in response to fasting we hope to understand how changes in the gene expression in these brain nuclei can regulate food intake, helping to understand the physiopathology of eating disorders and their related mood consequences. We use adult male Wistar rats under control and after 48 hours of food deprivation (N=6/group) to evaluate the global gene expression (RNA-seq) in the ARC and DRN in response to fasting. Our data demonstrate a significant (p<0.1) regulation of 272 genes in ARC (178 down and 94 up) and 182 genes in the DRN (117 down and 64 up). Furthermore, we note the convergence of 43 genes common downregulated in both ARC and DRN as is the case of some altered significant genes that have their correlation with energetic biological processes, such as Acat1, Acat2, Msmo1, Idi1, Hmgcs1, Insig1, Cyp51, Sc5d, and Dhcr7. Classifying common genes through ontological analysis, we identified the biological processes, such as ketone body catabolism and biosynthesis of lipids these pathways in turn are important for their performance and role in energy balance. With these transcriptomic data, we can visualize the most significant genes altered in both nuclei, enabling us to study the most affected pathways and biological processes in a fasting condition.

ID: 5430

Área: Fisiologia Comparada

Forma de Apresentação: Ê-POSTER

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### THE EFFECTS OF FEEDING ON AUTONOMIC CARDIAC CONTROL OF AN HERBIVOROUS LIZARD, THE GREEN IGUANA (*Iguana iguana*)

Carnivorous reptiles show a marked postprandial tachycardia mediated by a withdrawal of the inhibitory vagal tone and by non-adrenergic non-cholinergic (NANC) factors, but little is known about these adjustments in herbivorous reptiles. We investigated postprandial cardiovascular adjustments and autonomic mediation in an herbivorous lizard after 20h of voluntary feeding (3.5% of the body mass). Adults of *Iguana iguana* (both sexes; body mass of  $2.8 \pm 0.3$ kg) were cannulated on the femoral artery to acquire heart rate (fH), mean arterial pressure (MAP), and cardiac autonomic tones in fasting and digesting (n=7 each) before and after infusion of atropine (2.5mg/kg), and subsequently of propranolol (3.5mg/kg). Cardiac autonomic tone was compared via 1-way ANOVA and HolmSidak test, and fH and MAP were compared via RM (treatment) 2-way ANOVA and Holm-Sidak test ( $p \leq 0.05$ ). Ethics Committee 200/2019. Results are mean $\pm$ SEM. Untreated fasting animals showed fH of  $29.1 \pm 2.5$ bpm and MAP of  $8.9 \pm 0.3$ kPa. After infusion of atropine, fH increased ( $41.2 \pm 2.3$ bpm) and MAP decreased ( $7.8 \pm 0.2$ kPa). The double autonomic blockade decreased fH to  $23.7 \pm 1.2$ bpm, but MAP remained unchanged ( $7.3 \pm 0.5$ kPa). Untreated digesting animals showed fH of  $42.7 \pm 3.4$ bpm (higher than untreated fasting animals) and MAP of  $9.7 \pm 0.7$ kPa. After infusion of atropine, fH was higher ( $48.1 \pm 3.1$ bpm) and MAP did not change ( $8.8 \pm 0.7$ kPa). Double blockade reduced fH ( $27.8 \pm 1.3$ bpm), but MAP remained unchanged ( $6.9 \pm 0.2$ kPa). Fasting lizards showed a higher cholinergic tone ( $26.2 \pm 5.1\%$ ) than digesting animals ( $8.8 \pm 3.8\%$ ) while adrenergic tone did not differ between groups ( $42.0 \pm 1.6\%$  and  $41.5 \pm 2.8\%$ , respectively). Without changes in MAP, the results demonstrated that digestion in *I. iguana* was associated with a tachycardia of small magnitude mediated by a reduction of cardiac parasympathetic activity and no chronotropic effects of NANC factors.

ID: 5431

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### EFFECT OF ACETYL -COA CARBOXYLASE INHIBITOR IN THE TREATMENT OF OBESITY INDUCED BY NEONATAL OVERFEEDING

It is estimated that by 2025 more than 20% of the adult world population will be overweight and of these about 9% obese. In order to reverse or mitigate these projections, science has concentrated research aimed at alternative treatments for obesity and its metabolic consequences. Based on this principle and based on the literature, we hypothesized that the inhibition of the key enzyme of the lipogenic pathway Acetyl - CoA carboxylase would reduce the conversion of sugars into fat, thus preventing obesity.

Approved by CEUA No. 5134280920, pregnant female rats placed in individual boxes with free access to standard chow and water until birth of the pups, which is considered day 0. On day 3 after birth, the litters were adjusted to 9 pups per lactating in the Normal litter group (NL) and 3 pups per lactating in the Litter Reduction group (SL), N=12, giving preference to the use of male animals. At 21 days after weaning, the animals had free access to water and standard chow. At 75 days the animals were divided into 3 groups: SL- V control group (corn oil) and SL - 0.3 (0.3 mg/kg), both treated with ACCase inhibitor, diluted in oil via gavage, for 20 days. At 95 days-old, animals were euthanized. At 21 days SL puppies show greater weight gain compared to NL (NL  $47.75 \pm 1.101$  SL  $63.50 \pm 1.408$ ,  $p < 0.002$ ), confirming the induction. Adult offspring treated with a dose of 0.3 mg/kg tended to reduce the weight of subcutaneous adipose tissue (SL-V  $2.6430 \pm 1.880$ , SL-0.3  $1.629 \pm 2.170$ ,  $p < 0.1000$ ), periepididymal adipose tissue (SL-V  $4.986 \pm 5.737$ , SL-0.3  $3.8151 \pm 0.3478$ ,  $p < 0.2000$ ), retroperitoneal (SL-V  $6.386 \pm 0.8882$ , SL-0.3  $4.904 \pm 0.5587$ ,  $p < 0.4000$ ). The results obtained suggest that the inhibition of ACCase, leads a tendency to decrease fat deposition in obese animals, but further elucidation of the pathway and its interactions is needed, as well as higher number of animals to prove the efficacy of the inhibitor for treatment of obesity.

ID: 5432

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Centro Universitário Faculdade de Medicina do ABC (FMABC)

### **IN VIVO URINARY BLADDER REACTIVITY TO THE NEUROTRANSMITTERS OF THE AUTONOMIC NERVOUS SYSTEM AND VASOPRESSIN IN RATS WITH INTRACELLULAR DEHYDRATION OR ISOPROTERENOL TREATMENT**

Introduction: Water deprivation and hemorrhage strongly attenuate the UB reactivity to vasopressin (AVP), acetylcholine (Ach) and noradrenaline (NOR). Aim: to evaluate the effects of AVP, Ach and NOR on IP responses in other animal models of intracellular dehydration (ID) and hypovolemia (HYPO). Methods: All protocols were approved by CEUA-FMABC #04/2020. Female Wistar rats (14-16 wks-old, ~250 g) were submitted to ID with 2 ml of intragastric (IG) 2 M NaCl; or underwent HYPO mimic state with S.C. injection of isoproterenol (ISO) 100 µg/kg; or were maintained normovolemic (NV). After 2h, rats were isoflurane anesthetized and submitted to cannulation of the UB, and femoral artery and vein for IP, arterial pressure (AP) and heart rate (HR) recordings and intravenous infusions, respectively. After baseline recordings of AP, HR and IP for 15 min, in situ administration of 0.1 mL of AVP (1.0 ng/µL), or Ach (2.0 µg/mL), or NOR (2.0 µg/mL) or saline (vehicle) onto the UB was performed and the parameters were recorded for additional 15 min. Data are as mean±S.E.M. and submitted to unpaired Student t-test ( $P < 0.05$ ). Results: In rats with IG NaCl, the IP responses to in situ AVP ( $41.81 \pm 1.24\%$  vs.  $109.60 \pm 2.10\%$  NV), Ach ( $75.03 \pm 2.73\%$  vs.  $500.00 \pm 22.81\%$  NV) and NOR ( $-37.01 \pm 1.90\%$  vs.  $-67.12 \pm 1.74\%$  NV) onto the UB were significantly attenuated compared to NV rats. In ISO treated rats, IP responses to Ach ( $125.57 \pm 3.77\%$ ) and NOR ( $-23.09 \pm 0.64$ ) onto the UB were significantly attenuated compared to NV rats, nevertheless, the IP response to in situ AVP on the UB was enhanced ( $216.37 \pm 7.24\%$ ) in comparison to NV rats. Saline administrated in situ on the UB produced no significant changes in IP in IG NaCl or ISO treated rats or NV rats. Conclusion: The ID evoked by IG NaCl and HYPO mimetized by ISO decreased the UB reactivity to the neurotransmitters of the autonomic nervous system, however, the UB reactivity to AVP reduced in IG hypertonic NaCl model whereas enhanced in ISO treated rats.

ID: 5433

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **INFLUENCE OF WIDESPREAD CHRONIC MUSCLE HYPERALGESIA ON MATING AND PREGNANCY DEVELOPMENT**

Fibromyalgia (FM) is a chronic musculoskeletal disease of unknown etiology that affects mostly women. Sluka developed an animal model of widespread chronic muscle hyperalgesia (WCMH) by two unilateral injections of acidic saline, which mimics FM. Hyperalgesia is a potent stressor, 11 $\beta$ -hydroxysteroid dehydrogenase-2 (11 $\beta$ -HSD2) has a protective action in conditions of acute stress in pregnant women, in chronic conditions this protection may not be effective, hyperstimulating a pituitary fetal barrier. Adverse events that occur during pregnancy, such as chronic stress, can change the baby's health and disease pattern until adulthood. This project aims to analyze the influence of WCMH in the gestational process. The research was accepted by the Ethical Committee in animal research (protocol number 8239041219). Nine Wistar adult rats (6 females and 3 males), with 90 days and having 230g were splitted in: Acid Saline hiperalgesic (AS); Neutral Saline (NS) for SA control, and Gestational Control (CTRL). The behavioral analysis was performed in females before and after hyperalgesia, using: digital analgesimeter; hot plate and activity monitor. After induction, females were placed with males for mating, until vaginal copulatory plug was identified. For statistical analyses, it was used T Test, with data expressed with media  $\pm$  standard deviation (pvalue < 0.05). The cutaneous and thermal hyperalgesia was effective on group SA (p value: SA 0.0093; SN 0.6399; CTRL 0.4103). SA performed the copulation on the first day of union, SN and CTRL only on the third day. The gestation of SA lasted 23 days, of SN and CTRL lasted 22 and 21 days, respectively. SA gave birth to 12 rats with an average of 7.6g; SN for 20 rats with 7.8g; and CTRL for 12 rats with 7.1g. Our data establish that WCMH does not avoid copula, fertilization, or pregnancy. The rats' prosocial behavior can be manifested by empathy, which explains the greatest receptivity of the female for copulation.

ID: 5435

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade do Estado do Rio Grande do Norte (UERN)

### **CHANGES IN RENAL FUNCTION INCREASE THE NEED FOR ADVANCED VENTILATORY SUPPORT AND MORTALITY IN CRITICALLY ILL PATIENTS WITH COVID-19**

Renal failure in critically ill patients with COVID-19 is related to greater severity and mortality, however, its relationship with ventilatory support and severity has been little studied. Therefore, this study aims to relate the degree of renal and inflammatory impairment with mortality and the greater need for respiratory

support. For evaluation purposes, two distinct aspects were considered: 1– mortality in the ICU (death and discharge outcomes); 2– respiratory assistance (use of nasal cannula and invasive mechanical ventilation). We collected data from laboratory tests, arterial blood gases and Carbon dioxide, as well as information on its clinical evolution. In the 79 patients evaluated, the biochemical markers of renal function (urea [ $p=0.003$ ] and creatinine [ $p=0.002$ ]), as well as the inflammatory markers (CRP [ $p=0.006$ ], LDH [ $p=0.035$ ], Leukocytes [ $p=0.026$ ]) and the Partial Pressure of Carbon dioxide ( $PCO_2$ ) ( $p=0.001$ ) were significantly increased in patients who died. Urea ( $p=0.024$ ), creatinine ( $p=0.006$ ), CRP ( $p=0.004$ ), Leukocytes ( $p=0.013$ ) and  $PCO_2$  ( $p=0.000^*$ ) were also higher among patients who needed invasive mechanical ventilation. Acute lung injury (ALI) and acute kidney injury (AKI) are complications frequently encountered in critically ill patients. Damage to these organs occurs in clinical situations similar to systemic inflammatory response syndrome, shock, and evolution of multiple organ dysfunction. The cytokine storm and direct lesions present in COVID-19 generate these lesions and complications appear simultaneously, with the patient with renal failure being more likely to need more advanced ventilatory support and having a higher mortality rate. In conclusion, patients who have risk factors for AKI, must intensify the care, as they will have greater chances of needing ventilatory support and mortality in the ICU. COVID-19 is a complex disease that requires attention and treatment of several bodily systems, in addition to the respiratory one.

ID: 5436

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## EFFECTS OF EARLY MATERNAL DEPRIVATION ON INFLAMMATORY PARAMETERS WITHIN THE PREFRONTAL CORTEX OF MALE AND FEMALE RATS

Understanding mental health problems is still an issue for neuroscience research, and the use of animal models is still required to advance in the understanding of potential causative factors. Among these, Early Life Stress (ELS) emerges as one of the major risk factors for adulthood mental illness and neuroinflammation has been proposed as a possible mediator. Therefore, in the present study, we investigated brain inflammatory processes short after exposure to ELS, i.e. a single episode of maternal deprivation (MD, 24h at postnatal day, pnd, 9). Herein, male and female Wistar rats were used according to the European Directive 2010/63/EU and in compliance with the Spanish RD53/2013; all the experiments were approved by the local Animal Ethics Committee (Complutense University of Madrid, Spain: PROEX 006/19). Along development, MD induced a persistent decrease in body weight gain. Animals were then killed (pnd 13 and 20) and the prefrontal cortex (PFC) dissected to assess 1) brain cytokine and chemokine content by a Multiplex analysis; and 2) microglial cell expression labelled with the specific antibody Iba1. We found that MD induced a transient increase in pro-inflammatory cytokines (IL-1 $\beta$  and IL-6) in both male and female animals, in the absence of clear differences in Iba1 expression, although changes in microglial activation state were suggested and are currently being analyzed. Since neuroinflammation processes in the Central Nervous System are mainly mediated by glial cells, both microglia and astrocytes, that respond by releasing inflammatory mediators, further research is urged to undiscover the specific cellular players involved in the MD-induced pro-inflammatory state here described for the PFC as well as its future functional implications.

ID: 5438

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **EVALUATION OF THE ANTI-INFLAMMATORY AND ANTINOCICEPTIVE ACTIVITY OF THE ETHANOL EXTRACT AND THE DICHLOROMETHANE FRACTION OF THE BARK OF PELTOGYNE PAUCIFLORA BENTH**

*Peltogyne pauciflora* Benth (Leguminosae), is a plant popularly known as Imburanhê, and the bark infusion is used to treat inflammation and low back pain by the population of Contendas do Sincorá (Bahia, Brazil). This study aimed to evaluate the ethanolic extract (EE) 50 mg/kg from the bark of *P. pauciflora* and the dichloromethane fraction (D) 50 mg/kg for its anti-inflammatory and antinociceptive activity. For the experiments, a total of 96 Balb-c mice, (n=6), adult (20 to 30 g), male, kept in the vivarium of the Instituto Multidisciplinar em Saúde/Campus Anísio Teixeira, Universidade Federal da Bahia, were used. The study was approved by the CEUA of the IMS-UFBA (protocol n° 073/2019). To evaluate the antinociceptive activity, the tests of abdominal writhing induced by acetic acid, formalin and mechanical hypernociception were carried out. For anti-inflammatory activity, neutrophil migration and vascular permeability assays were performed. Results were expressed as mean  $\pm$  S.D. For statistical analysis, one-way ANOVA was used, followed by the Dunnett post-test, or Kruskal Wallis, followed by the Dunn's post-test, with  $P < 0.05$ . The extract showed antinociceptive activity in abdominal writhing, EE ( $23.14 \pm 9.43$ ) and D ( $34.78 \pm 14.13$ ) compared to VH ( $58.71 \pm 17.29$ ); formalin test, EE ( $20.5 \pm 12.28$ ;  $18.86 \pm 11.72$ ), D ( $28.6 \pm 7.23$ ;  $6.71 \pm 3.98$ ) and morphine ( $4.83 \pm 2.84$ ;  $7.14 \pm 4.4$ ) compared to VH ( $51.47 \pm 14.52$ ;  $43.4 \pm 23.27$ ) in the two phases respectively; and in mechanical hypernociception EE ( $1.55 \pm 0.56$ ), D ( $0.082 \pm 0.56$ ) compared to VH ( $3.58 \pm 0.66$ ). The extract showed anti-inflammatory effect by reducing the neutrophil migration EE ( $1.57 \pm 0.84$ ), D ( $1.87 \pm 0.43$ ) compared to VH ( $6.4 \pm 2.03$ ); and the permeability EE ( $2.27 \pm 0.78$ ), D ( $1.99 \pm 0.24$ ) compared to VH ( $3.87 \pm 1.59$ ). This is the first report of a biological study of EE and fraction D, they showed good results, being a promising natural source for therapeutic use and identification of new compounds.

ID: 5440

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **THE EFFECT OF DRUG VS LIFESTYLE APPROACH IN A SUBCLINICAL DOXORUBICIN ANIMAL MODEL**

Doxorubicin (DOX) is an effective anticancer agent that improved survival but causes dose-dependent cardiotoxic effects that can be counteracted by preventive strategies. In this work, we sought to compare

the efficacy of two different approaches, physical exercise and atenolol to maintain physiological homeostasis, in a subclinical animal model of DOX. Female Wistar rats were divided into: DOX (ip. 2mg/Kg, 1time/week, for 4weeks), DOX with physical exercise (DOX+EX; treadmill, 22cm/seg for 30min, 5times/week), DOX with  $\beta$ -blocker (DOX+ATN: Atenolol; oral, 5times/week, for 4weeks) and controls (ip., saline). At the end of the protocol, blood pressure (BP), ECG, heart rate (HR) and respiratory frequency were recorded. Baro and chemoreflexes, low frequencies (LF) and high frequencies (HF) were evaluated. One-way ANOVA with Tukey's multiple comparison between means were used (signif.  $p < 0.05$ ). DOX treatment triggered a significant decrease in systolic (CTL:156 $\pm$ 6 vs DOX:114 $\pm$ 9mmHg), diastolic (CTL:105 $\pm$ 3 vs DOX:83 $\pm$ 8mmHg) and mean BP (CTL:127 $\pm$ 3 vs DOX:97 $\pm$ 9mmHg) as well as in HR (CTL:378 $\pm$ 24 vs DOX:289 $\pm$ 28bpm), decreased baro (CTL:1.5 $\pm$ 0.3 vs DOX:0.4 $\pm$ 0.1bpm/mmHg) and chemoreflexes (CTL:22 $\pm$ 2 vs DOX:18 $\pm$ 3cpm), without evidence of sympatho-excitation (LF, CTL:2.93 $\pm$ 0.9mmHg<sup>2</sup> vs DOX:0.65 $\pm$ 0.17mmHg<sup>2</sup>). During DOX treatment, the exercise protocol normalized systolic (165 $\pm$ 5mmHg), diastolic (123 $\pm$ 6mmHg) and mean BP (141 $\pm$ 5mmHg) and HR (406 $\pm$ 6bpm) to physiological values and decreases the loss in baroreflex gain (0.5 $\pm$ 0.06bpm/mmHg). Chemoreflex sensitivity, sympathetic and parasympathetic activities remained similar. Atenolol treatment increased baroreflex gain (0.9 $\pm$ 0.2bpm/mmHg) and cause a clear tendency to maintain BP values. Although complementary data is needed, with these results we can conclude that treadmill training was more effective than atenolol in counteracting the adverse effects of DOX, suggesting that is a good non-pharmacological alternative for preserving the homeostasis during DOX therapy.

ID: 5441

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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## EFFECT OBESITY ON INFLAMMATORY BIOMARKERS IN COVID-19

CoViD-19 is the disease caused by SARS-CoV-2. The disease promoted a global health crisis with significant socioeconomic impact. Studies have shown that severe abnormalities in patients CoViD-19 patients can be related to dysregulated inflammation and coagulation. Patients who develop severe CoViD-19 have elevated index of fibrin degradation products, low levels of fibrinogen, in addition to elevated concentrations of IL-6, TNF and IL-1. Most individuals who develop the severe stage of this disease already have comorbidities, which may predispose them to coagulation and inflammatory disorders. Obesity is a factor related to the higher frequency of hospitalization and death of patients with CoViD-19. The primary objective of the study is to compare blood coagulation biomarkers (prothrombin time, activated partial thromboplastin time) and inflammatory biomarkers (global and differential leukocyte counts, IL-10, IL-6 and TNF levels) between eutrophic and CoViD-19 patients with obesity, who are hospitalized and in isolation in the city of Diamantina-MG (CAAE:36261420.80000.5108 and 34189420.2.0000.5108). Data collection on the patient's clinical status, comorbidities, age and other variables will occur through the analysis of medical records provided by the Santa Casa de Caridade de Diamantina and through patient interview. Blood collection will be done in patients admitted to health units and those who are at rest in their homes. The analysis of prothrombin and thromboplastinactivated partial time will be performed by the Oswaldo Cruz Laboratory, and analyzes of blood count and plasma cytokines profile will be performed at the Laboratory (BIOEX) of UFVJM.

ID: 5442

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **ROLE OF GLUTAMATERGIC NEUROTRANSMISSION IN RVLM FOR CARDIOVASCULAR AND SYMPATHETIC RESPONSES INDUCED BY TNF $\alpha$ IN PVN**

Neurogenic hypertension refers to a chronic increase in blood pressure (BP) associated with excessive sympathetic nerve activity (SNA). Pro-inflammatory cytokines in the hypothalamic paraventricular nucleus (PVN) and rostral ventrolateral medulla (RVLM) have been implicated in driving SNA. However, the central pathways involved in this process remain to be clarified. This study investigates the role of RVLM glutamatergic neurotransmission in cardiovascular and autonomic responses induced by tumor necrosis factor alpha (TNF $\alpha$ ) in PVN. Spontaneously hypertensive rats (250-300g; n° 061/17-UFG) were anesthetized and instrumented to record BP and splanchnic SNA. Nano-injections (50 nL) of kynurenic acid (KYN; n=6; glutamate receptor antagonist; 50mM), AP5 (AP5; n=7; NMDA receptor antagonist; 24 nmol/50 nL), NBQX (NBQX; n=6; AMPA receptor antagonist; 5.2 nmol/50 nL) or vehicle (Sham; n=7; ringer's solution) were performed in the RVLM prior to TNF $\alpha$  (12  $\mu$ M) nano-injections in the PVN. Nano-injections in RVLM did not change the baseline BP ( $\Delta$ - Sham:  $-2.2 \pm 1.5$ ; KYN:  $+13.2 \pm 3.2$ ; AP5:  $-3.1 \pm 2.0$ ; NBQX:  $+3.2 \pm 5.2$  mmHg) and SNA ( $\Delta$ - Sham:  $+6.0 \pm 2.4$ ; KYN:  $-2.0 \pm 2.9$ ; AP5:  $+6.3 \pm 2.0$ ; NBQX:  $-1.7 \pm 3.2$  %; 10 min after RVLM injection, from baseline) values. In Sham, PVN TNF $\alpha$  promoted progressive ramp-like in SNA ( $\Delta$   $+81.6 \pm 13.7$  %,  $p < 0.05$ ) and increase in BP ( $\Delta$   $+18.5 \pm 1.4$  mmHg,  $p < 0.05$ , 60 min TNF $\alpha$ , from baseline). The previous glutamatergic blockade of RVLM abolished this sympatoexcitation ( $\Delta$   $+1.5 \pm 5.1$  %), without affect BP ( $\Delta$   $+21.4 \pm 3.1$  mmHg, 60 min TNF $\alpha$ , from baseline). Specific NMDA or AMPA receptor blockade in RVLM attenuates the TNF $\alpha$ -induced SNA increase in PVN ( $\Delta$ - NMDA  $+20.9 \pm 2.5$ ; AMPA:  $+34.4 \pm 1.1$  %), without affect BP ( $\Delta$ - NMDA:  $+19.1 \pm 4.1$ ; AMPA:  $+15.5 \pm 3.5$  mmHg, 60 min TNF $\alpha$ , from baseline). Results indicate that the sympatoexcitation TNF $\alpha$ -induced in PVN is dependent on glutamatergic neurotransmission, more specifically of the integrity of NMDA and AMPA receptors in RVLM.

ID: 5443

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de São Paulo (UNIFESP)

### **ADMINISTRATION OF ESTRADIOL ENANTHATE COMBINED TO ALGESTONE ACETOFENIDE ON MALE RATS – EFFECTS ON RENAL FUNCTION**

The use of estrogen/progestin containing formulations have been widely used to aid body changes during the transition from male to female phenotype, in Brazil and worldwide. However, few studies assessed the repercussions of this procedure on the body's systems. Thus, in this work we evaluated the effects of

chronic administration of the combination of estradiol enanthate and algestone acetofenide in male rats on blood pressure and renal function. Two-month-old Wistar rats were divided into two groups: 1) Control (C) treated with vehicle, and 2) Perlutam® (P) treated with 6mg algestone-acetofenide combined to 0.4mg estradiol enanthate IM, every 10 days for 20 weeks. Parameters analyzed: blood pressure (BP), body weight (BW), nasal-anal length (NAL), food intake (FI), water intake (WI), urea (Ur) and creatinine (Cre) serum concentration, urinary volume (UV), sodium (UNa+), potassium (UK+) and titratable acidity (UTA) excretion. Urine samples were collected for 24 hours in metabolic cages. Results presented as mean  $\pm$  SD;  $p \leq 0.05$  t test; CEUA:0573101218. The hormonal treatment had significant repercussions in BW and NAL [BW(g) C:462.8 $\pm$ 24.4; P:324.5 $\pm$ 31.1\*; NAL (cm) C:27.5 $\pm$ 0.7; P:24.5 $\pm$ 0.4\*], even with an increase in FI [FI(g/24h) C=12.8 $\pm$ 2.8; P: 18.6 $\pm$ 1.6\*]. Regarding renal function, there was increase in Ur [Ur(mg/dl) C:40.4 $\pm$ 9.6; P:55.0 $\pm$ 4.8\*], Cre [Cre(mg/dl) C:0.35 $\pm$ 0.05; P:0.47 $\pm$ 0.05\*], UV [UV(ml/24h) C: 10.9 $\pm$ 2.1; P:15.5 $\pm$ 2.1\*], UNa+[UNa+( $\mu$ Eq/min/kg) C:1.7 $\pm$ 0.5; P:3.1 $\pm$ 0.8], and UK+ [UK+( $\mu$ Eq/min/kg) C:0.53 $\pm$ 0.15; P:0.91 $\pm$ 0.22\*], there was no change in BP [BP(mmHg) C:126 $\pm$ 6.5, P:129 $\pm$ 7.6] and in UTA [UAT ( $\mu$ Eq/min/kg) C: 0.32 $\pm$ 0.20; P:0.27 $\pm$ 0.13]. Conclusions: The use of Perlutam® modified the body structure as well as altered several parameters of renal function, but without repercussions on blood pressure. More evaluations are needed to understand the repercussions of this hormonal treatment on kidney function of male rats.

ID: 5444

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER - Prêmio Branca

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## FEMALE OFFSPRING HAVE MUSCLE PROTECTION AGAINST MATERNAL VITAMIN D DEFICIENCY

The fetal stage is a critical developmental window for the skeletal muscle, but little information is available about the impact of maternal vitamin D deficiency (VDD) during pregnancy in muscle development. The objective was to compare the effects of maternal VDD in utero and early postnatal life on the EDL muscle development of male and female offspring. For this, 5-week-old female Wistar Hannover rats were fed either a Vit. D3+ diet (1000 IU; CTRL) or Vit. D3- diet (0 IU; VDD) for six weeks and during gestation and lactation. At 21 d of age, offspring were separated into four groups: female and male offspring control (FCTRL and M-CTRL) and VDD (F-VDD and M-VDD) and euthanized. (CEUA 052/2018). Both VDD groups showed a reduction in the calcidiol serum concentration (5 $\pm$ 0.4 ng/ml vs. 28 $\pm$ 0.8 ng/ml in F-CTRL and 5 $\pm$ 0.3 ng/ml vs. 29 $\pm$ 0.9 ng/ml in M-CTRL) and weighed less than their respective controls in the first month (66 $\pm$ 2 vs. 76 $\pm$ 1 g in F-CTRL and 69 $\pm$ 2 vs. 78 $\pm$ 2 g in M-CTRL), showing a delay in the development, but they recovered weight in the 60 d postweaning. In F-VDD, the number of satellite cells (SCs) is 51% higher than FCTRL, and there was no difference in the number of muscle fibers between the two groups. On the other hand, maternal VDD impairs the EDL development in M-VDD, reducing the number of fibers (42%) and SCs (36%). Maternal VDD also did not affect the cross-sectional area of EDL muscle fibers in the F-VDD group. However, M-VDD had muscle atrophy of MHC-IIB (32%) and MHC-IIX (58%) fibers. Interestingly, while F-VDD showed a reduction in the content of Atrogin-1 (42%), M-VDD had an increase (46%). These results show that the skeletal muscle of female and male offspring respond differently to maternal VDD. Female muscle appears to be protected and responds better to this disturbance, showing an apparent sex-specific effect induced by maternal VDD. This protection seems to come from early life, which suggests some placental protective factors.

ID: 5447

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **PILOCARPINE-INDUCED WATER INTAKE AND SALIVARY SECRETION IN RATS FED A HIGH-FAT DIET FOR 3 WEEKS**

Obesity can lead to comorbidities such as hypertension and a reduction of salivary secretion, which can lead to periodontitis. Pilocarpine is a cholinergic agonist used to treat dryness of the oral mucosa in patients with salivary gland diseases. In addition to stimulate salivation, pilocarpine also induces water intake. In the present study, we investigated pilocarpine-induced water intake and salivation in rats fed a high-fat diet (HFD) for 3 weeks. Adult male Holtzman rats (300-310 g) were fed for 3 weeks with a standard diet (SD, 11% calories from fat, n = 10/group) or a HFD (46% calories from fat; n = 12/group). To measure salivary secretion, the animals were anesthetized with ketamine [100 mg/kg of body weight (b.wt.), intraperitoneally (ip)], and previously weighed cotton balls were placed in the oral cavity for 7 minutes after pilocarpine injection (1 mg/kg of b.wt., ip). Water intake was measured each 15 min for 60 min starting immediately after pilocarpine injection. Submandibular gland and liver frozen sections were stained by Oil red O for detection of lipids. The salivary secretion induced by pilocarpine was reduced in HFD rats compared to SD rats (SD:  $183 \pm 37$  vs. HFD:  $145 \pm 28$  mg/100 g of b.wt./7 min,  $p < 0.05$ ). On the other hand, pilocarpine-induced water intake increased in HFD rats compared to SD rats (SD:  $0.84 \pm 0.1$ , vs. HFD:  $1.0 \pm 0.03$  ml/100g of b.wt./60 min;  $p < 0.05$ ). In HFD animals, the weight of mesenteric, epididymal and retroperitoneal adipose tissues was greater than in SD (HFD:  $0.46 \pm 0.02$ ,  $0.85 \pm 0.04$ ,  $0.92 \pm 0.05$ , vs. SD:  $0.33 \pm 0.02$ ,  $0.59 \pm 0.04$ ,  $0.58 \pm 0.04$  g/100 g of b.wt.,  $p < 0.05$ ). The Oil Red O staining showed a massive concentration of lipid droplets in the liver and only few lipids in the submandibular glands. Therefore, few weeks of HFD are enough to increase liver lipids and to change salivary secretion and water intake induced by pilocarpine in rats.

ID: 5448

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **IDENTIFICATION OF SPECIFIC BEHAVIORS BY THREE-DIMENSIONAL ACCELERATION IN TEGU LIZARDS**

With the advent of contemporary technologies for remote monitoring, it is possible to determine the daily and seasonal patterns of activity, and the organism-environment interactions in free-living animals, without the observer's interference. One of these devices is the three-dimensional accelerometers, used to quantify the animal activity based on the acceleration changes in the three orthogonal axes X, Y e Z, corresponding to the surge, swing and heavy accelerations. The validation of the behavior patterns identified by the accelerometers would be useful for remote field measurement. The goal of the present

study was to validate the use of the three-dimensional accelerometers to distinguish specific behaviours the tegu lizard *Salvator merianae* in captivity, through the comparison between visual notes of specific behaviours (recorded video) and the acceleration data from the accelerometers. In this study, we used 10 animals, 5 males and 5 females, all equipped with a vest in which the accelerometers were fixed next to the shoulder blade. Based on the video analysis we were able to identify five patterns of behaviour, such as feeding, walking, resting, nest building and copulation attempt. The accelerometer data from each one of those activities was extracted with the software SAS 9.4 and a Random Forest statistical analysis was applied, validating these models of behaviour and achieving an 86.02% precision. Thus, our results show that it is possible to identify a range of basic specific behaviors and reproduction behaviours of *S. marinae*, through the technique of the three-dimensional accelerometers.

*ID: 5450*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER - Prêmio Branca*

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*Instituições: Universidade Federal de Alfenas (UNIFAL-MG)*

### **MATERNAL IMMUNE ACTIVATION DISRUPTS SOCIAL BEHAVIOR IN THE OFFSPRING AND ALTERS EXPRESSION OF OXYTOCIN RECEPTOR, GLUCOCORTICOID RECEPTOR AND SYNAPTOPHYSIN IN THE PREFRONTAL CORTEX OF MALE OFFSPRING**

Maternal immune activation (MIA) has been associated to a variety of neurodevelopmental disorders. The aim of this study was to evaluate behavioral and molecular changes in the offspring of females submitted to MIA induced with LPS during the 16th day of gestation. Female Wistar rats were treated with saline (1 ml/kg i.p.) or LPS (500 µg/kg i.p.) at 16th day of gestation. To assess sickness behavior, locomotion in the open field was recorded 2 hours (hrs) after LPS administration, along with food intake and weight gain at 24 hrs. In the offspring, animals were submitted to play behavior test at postnatal day 30. Prefrontal cortex was collected for western blot analysis of the proteins synaptophysin, glucocorticoid receptor (GR) and oxytocin receptor (OTR). All experimental procedures followed the Ethical Principles in Animal Research adopted by the Ethics Committee on the Use of Animals of the Federal University of Alfenas (protocol 17/2019). In pregnant females, administration of LPS decreased locomotion in the open field (distance traveled: 1612±72.3 to 862±88.5 cm; p<0.0001), decreased food intake (27.4±1.1 to 5.5±2.2 gr; p<0.0001) and weight gain (12.9±0.8 to -10.3±3.5 gr; p<0.0001). In the offspring, LPS decreased the time of social interaction (females: 21.5±1.8 to 12.3±1.2 sec; p<0.0005, and males: 37.9±3.2 to 26.3±2.7 sec; p<0.05). In the prefrontal cortex, LPS increased the OTR in females and males (females: 100±5.6 to 134.2±10.5; p<0.05, and males: 88.4±10.1 to 159.7±21.2; p<0.05). In male offspring, LPS decreased the expression of synaptophysin (99.1±4.8 to 79.3±4.9; p<0.05) and GR (100±9.1 to 72.43±6.7). Results demonstrate that administration of LPS during gestation was able to alter social behavior of male and female offspring in association with higher expression of OTR in the prefrontal cortex. Expression of synaptophysin and GR suggest that sexual dimorphism may be involved in behavioral and molecular changes resulting from MIA.

ID: 5451

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM)

### **HIGH-SALT DIET IN THE PRE- AND POST-WEANING PERIODS PROVIDES AMYGDALA OXIDATIVE STRESS AND CHANGES IN LOCOMOTION AND ANXIETY-LIKE BEHAVIORS OF MALE WISTAR RATS**

High-salt diets have recently been linked to oxidative stress in the brain, a fact that may be a precursor to behavioral changes, such as those involving anxiety-like behavior (He et al, 2020; Santisteban & Iadecola 2018). We evaluated the amygdala redox state and anxiety-like behavior after using a high-salt diet in the pre- (reconception, gestation and lactation) and post-weaning periods. The experimental protocol was approved by CEUA-UFVJM 025/2018. Male and female Wistar rats were kept on a standard or high-salt diet for 120 days. After mating, females maintained the mentioned diets during gestation and lactation. Weaning occurred at 21 days and male pups were subdivided: C-C, standard diet; C-HS, offspring received high-salt diet postweaning; HS-C, parents received high-salt diet pre-weaning; HS-HS, parents and offspring received high-salt diet in pre- and post-weaning periods. The offspring (~350g) performed elevated plus maze (EPM) and open field (OF) tests at adulthood. After the tests, the amygdalas were collected for redox analysis. The HS-HS group ( $164.1 \pm 32.9$ ) showed higher locomotion in the OF test compared to CC ( $134 \pm 17.41$ ), C-HS ( $105.7 \pm 23.8$ ) and HS-C ( $109 \pm 42.3$ ) groups ( $p < 0.01$ ). The CHS group reported the highest time spent in the open arms ( $17.5 \pm 5.9$ ), in relation to CC ( $11.6 \pm 4.4$ ), HS-C ( $11.6 \pm 4.4$ ) and HS -HS ( $7.6 \pm 5.2$ ) groups ( $p < 0.05$ ). The results of the EPM and OF tests showed that the HS-HS group developed hyperactivity and the C-HS group had lower anxiety-like behavior. Redox state analysis showed a significant difference in TBARS levels ( $p > 0.05$ ), C-HS ( $0.60 \pm 0.19$ ), HS-C ( $0.57 \pm 0.15$ ), and HS-HS ( $0.63 \pm 0.24$ ) groups reported higher levels compared to C-C group ( $0.33 \pm 0.09$ ). ANOVA and Newman Keuls test were used when necessary ( $p < 0.05$ ). Thus, our data show that regardless of the period, salt caused oxidative stress in the amygdala, which may be related to observed anxiety-like behaviors.

ID: 5452

Área: Fisiologia Comparada

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual Paulista (UNESP)

### **COMPARING MITOCHONDRIAL OXYGEN CONSUMPTION IN RED AND WHITE MUSCLE FIBERS OF TEGU LIZARDS**

Tegu lizards (*Salvator merianae*) exhibit a robust annual cycle of high activity during the spring and summer, and hibernation during winter. This species particularly outstands on presenting facultative

endothermy during the spring reproduction phase. The seasonal changes in activity may be accompanied by changes in muscle mitochondrial function. Tegus are characterized by presenting red muscle fibers with high oxidative levels mainly in the forelimbs and white fibers, with lower oxidative levels in the hindlimbs. The aim of the present study was to investigate mitochondrial function in these limb muscles of *S. merianae*. To this end, muscle biopsies were collected from anesthetized animals (5 females, at 25°C; February; CEUA protocol: 008948-18), fibers were mechanically separated, and saponin-permeabilized, for measurements of mitochondrial oxygen consumption in a two-chamber oxygraph. In one chamber, leak and phosphorylating respiration rates were evaluated using substrates linked to complexes 1 and 2 of the respiratory chain. Simultaneously, in the other chamber, the contributions of the uncoupling protein (UCP) and adenosine nucleotide translocator (ANT) on the leak state were tested using their respective inhibitors, GTP and CATr. For these variables, differences between the two muscle types were evaluated by Student's T-Test, considering significant differences when  $p < 0.05$ . There were no significant differences on mitochondrial activity and uncoupling between the two fiber types analyzed during the summer period. These preliminary results indicate that during a season of high activity, but not coincident with reproduction, limb muscles of tegus presented low mitochondrial respiration and uncoupling, as expected for an ectothermic species. The next steps are to compare these results with the reproductive phase, when we expect that mitochondrial activity and/or uncoupling will be increased, associated with reproductive endothermy.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## **GLUTAMATE-MEDIATED ASTROCYTE-NEURON COMMUNICATION IN THE HYPOTHALAMIC ARCUATE NUCLEUS DRIVES FEEDING BEHAVIOR**

The arcuate nucleus of the hypothalamus (ARC) plays a pivotal role in controlling energy balance. Accumulating evidence suggests that neurons and astrocytes in the ARC cooperate for adequate physiological responses to metabolic cues. However, the underlying mechanisms by which astrocytes in the ARC influence neuronal circuitries governing feeding behavior are poorly elucidated. Here, we aimed to investigate whether the manipulation of astrocyte activity within the ARC modulates neuronal physiology and behavior involved in energy homeostasis. We report that 5-day selective chemogenetic activation [i.p. clozapine-N-oxide (CNO) administration; 0.3 mg/Kg, 2x/day] of glial fibrillary acidic protein (GFAP)-expressing astrocytes in the ARC increases food intake and body weight of male ARCGFAP-hM3Dq mice (*Mus musculus*) in comparison to saline-injected control littermates. Moreover, neuropeptide Y (NPY)-expressing neurons in the ARC of ex vivo brain slices from CNO-treated ARCGFAP-hM3Dq mice exhibit higher firing activity and greater frequency of Nmethyl-D-aspartate receptor (NMDAR)-activated slow inward currents, the latter the hallmark of glutamate-mediated astrocyte-neuron communication. Furthermore, the simultaneous activation of GFAP-expressing astrocytes and inhibition of agouti-related protein (AgRP) neurons by CNO treatment in ARCGFAP-hM3Dq; ARCAgRP-hM4Di mice abolish the feeding response. Our data suggest that the release of glutamate from astrocytes in the ARC increases the excitability of neighboring AgRP/NPY neurons via the activation of extrasynaptic NMDAR, ultimately leading to an obesogenic phenotype.

ID: 5455

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **RENIN IS RELATED TO THE TRAP INCREASED EXPRESSION IN NORMOGLYCEMIC BUT NOT IN HYPERGLYCEMIC MICE WITH PERIODONTAL DISEASE**

The aim of the study was to evaluate the role of renin on the expression of bone metabolism markers in the mandible of normoglycemic (NG) and hyperglycemic (HG) mice with periodontal disease (PD). BALB / c adult from 5 to 8 weeks of age, weighing 22 to 28g male mice received a single intraperitoneal injection of streptozotocin (200 mg/kg), and animals with glucose levels of 250 mg/dL or higher, after 7 days, were considered diabetic. Aliskiren (Alisk), a renin inhibitor, was given by gavage (50 mg/kg) once a day for 15 days, starting 1 day before PD induction, which was performed by inserting a ligature around the mice lower first molars. After 15 days, mandibles were collected for the analysis of bone formation markers (Runx2, Osx, Catnb, Alp, Col1a1, Opn, Ocn, Bsp, Bmp2), bone remodeling (Opg, Rankl, Rank) and bone resorption (Trap, Ctsk, Mmp-2 and -9, Oscar, Vtn, Itga5 and Itgb5) by qRT-PCR. HG, compared to NG mice, showed an increase in Osx, Ctnnb, Opn, Ocn and Bmp2 expression. PD reduced Runx2, Osx and Ctnnb in HG, while Ctnnb increased in NG, compared to the respective control. Alisk reduced Runx2 only in NG. In NG, PD increased Col1a1 and Bsp, while in HG, there was an increase in Opn and Bsp, a decrease in Alp, Col1a1, Ocn and Bmp2, and Alisk reduced Opn only in HG with DP. Regarding bone resorption markers, HG showed an increase in Trap and Vtn, compared to NG mice. PD induced an increase of Trap, Mmp9, Ctsk and Oscar in NG and HG. Only in HG, PD decreased Mmp2, Vtn, Itga5 and Itgb5. Alisk in NG+PD reduced Trap, Mmp2 and Itga5 expression, compared to untreated mice, while in HG+PD, Alisk increased Oscar and Itga5 expression. Renin activity seems to regulate Opn, Col1a1, Bsp, Trap and Mmp2 in NG mice with PD, while in HG mice, Opn, Oscar and Itga5 were modulated. The nature of this differential response still needs to be further investigated.

ID: 5456

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **WHY WE SHOULD PREFER AEROBIC, ANAEROBIC, OR MULTICOMPONENT TRAINING TO CONCURRENT EXERCISE TO PREVENT ALZHEIMER'S DISEASE-RELATED MEMORY DEFICITS**

Alzheimer's Disease (AD) causes memory deficits, and one of its primary pathological markers is the amyloid-beta (A $\beta$ ) brain deposition. We investigated different combinations of exercise in the prevention of AD-related memory deficits and hippocampal oxidative balance. The ethics committee approved the study (n. 031/2018). Adult male Wistar rats (90 days; ~450g) were divided into 5 groups (n=7-12/group):

I. No intervention (NI); II. Running (Run; on a treadmill at 60-70% of indirect  $VO_2$ max); III. Strength (Str; climb an inclined ladder at 50-100% of maximum carriage load); IV. Concurrent (Conc; Run+Str at the same day), and; V. Multicomponent (Multi; Run+Str+cognitive training on the Barnes maze, each one twice-a-week on different days). Run, Str, and Conc exercised 3, while Multi exercised 6 times a week, for 8wk. After, groups were divided into control (CT; saline) and amyloid-beta ( $A\beta$ ; 1-42  $A\beta$  fragment) and submitted to saline or  $A\beta$  hippocampal infusion. After 10d, the object recognition (OR) task was performed, and rats were euthanized and the hippocampus isolated for biochemical analyses. In the OR test, all non $A\beta$  groups explored for more than 50% of total exploration time the novel object ( $P < 0.05$  for all groups), demonstrating memory consolidation.  $A\beta$  caused memory deficit in the NI group ( $55.84 \pm 5.83$ ;  $P = 0.072$ ). Run, Str, and Multi ( $P < 0.05$  for all), but not Conc (Conc+ $A\beta$ :  $54.17 \pm 4.17$ ;  $P = 0.184$ ), prevented the deficit. Within  $A\beta$  groups, the levels of reactive oxygen species were lower in Str+ $A\beta$  than Multi+ $A\beta$  (-34%;  $P = 0.012$ ) and Conc+ $A\beta$  (-35.3%;  $P = 0.010$ ). Lipid peroxidation was lower in Run+ $A\beta$  (-45.3%;  $P = 0.039$ ) and Multi+ $A\beta$  (-52.3%;  $P = 0.006$ ) compared to NI+ $A\beta$ .  $A\beta$  reduced the hippocampal antioxidant capacity (AC) in NI ( $P = 0.003$ ), while Multi+ $A\beta$  presented higher AC than all others  $A\beta$  groups (at least 53.3%;  $P < 0.015$  for all). Running or strength out of or within a multicomponent exercise, but not the concurrent exercise, prevented the AD-related memory deficits.

ID: 5457

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### HIGH LEVELS OF IMPINGING SOLAR RADIATION IN AN EQUATORIAL SEMI-ARID REGION IMPAIR THERMOREGULATION OF A LOCALLY ADAPTED SHEEP BREED

In a semiarid environment, high levels of solar radiation can become a challenge for the thermoregulation of sheep. We investigated the impact of solar radiation on the thermal equilibrium of hair-coat sheep raised under natural conditions in a semi-arid region of Brazil. All procedures described in this study were performed in accordance with the Ethics Committee (CEUA) of the State University of São Paulo (process number: 17.519/14). Ten adult Morada Nova ewes ( $32.8 \pm 3.7$  kg, mean  $\pm$  SD) were randomly exposed to, or protected from, solar radiation between 07:00 and 16:00 for assessment of their bio-thermal responses and gas exchanges rates over twenty consecutive days. From 10:00 to 14:00, solar radiation ranged from  $550 \pm 60$  to  $1100 \pm 30$  W m<sup>-2</sup>, and mean radiant temperature varied from  $45 \pm 4$  to  $55 \pm 8$  °C in the full sun (exposed), and from  $30 \pm 2$  to  $37 \pm 3$  °C in the shade. When exposed to solar radiation, ewes had potential to absorb up to 350 W m<sup>-2</sup> of thermal energy by long and short-wave radiation, thereby significantly increasing costs for regulating body temperature. Overall, they had hair coat surface (+ 15 °C), body rectal temperature (+ 1.2 °C), respiratory rate (+ 30 breaths min<sup>-1</sup>), evaporative heat transfer through the respiratory tract (+ 10 W m<sup>-2</sup>), and metabolic rate (+ 10 W m<sup>-2</sup>) higher ( $P < 0.05$ ) than those in the shade. Under such circumstances, by accounting for heat generated through metabolism (45 W m<sup>-2</sup>), absorbed from thermal radiation (350 W m<sup>-2</sup>), minus that eliminated through the respiratory evaporation (20 W m<sup>-2</sup>), and then solving for the evaporative requirements to maintain their thermal equilibrium, ewes exposed to solar radiation may need to evaporate up to 500 g m<sup>-2</sup> h<sup>-1</sup> of sweat through the skin surface to offset the accumulated heat load. In conclusion, exposition to direct solar radiation therefore imposes a significant heat load on the sheep, by increasing their thermoregulatory costs in terms of energy and water usage.

ID: 5458

Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

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Instituições: *Universidade de Pernambuco (UFPE), Escola Superior de Educação Física (UPE/ESEF)*

### **NORMATIVE VALUES OF THE 6-MINUTE WALK TEST IN PATIENTS ELIGIBLE FOR BARIATRIC SURGERY AS PARAMETERS OF CARDIORESPIRATORY FITNESS**

Obesity has become a global concern, mainly due to the rapid growth in the number of people eligible for bariatric surgery, who have a high degree of this condition ( $BMI \geq 35 \text{ kg/m}^2$ ). In addition, these individuals have a high risk of mortality and anatomical and physiological changes that can directly interfere with the uptake, transport and consumption of oxygen by cells. In turn, this interference results in low cardiorespiratory fitness, considered an important marker of physical performance and health. One of the ways to assess cardiorespiratory fitness in this population is through the 6-minute walk test, as it is a low-cost and simple to perform test, it has been a good intervention alternative in this population, compared to the cardiopulmonary exercise test. In this sense, the aim of this systematic review was to find normative values for the 6-minute walk test in patients eligible for bariatric surgery, with  $BMI \geq 35 \text{ kg/m}^2$ , in order to identify reference values for this population. To perform the search, descriptors related to the patient eligible for bariatric surgery and the 6-minute walk test were used. The search was performed in the PUBMED, EMBASE, SCOPUS, WEB OF SCIENCE and COCHRANE LIBRARY databases. Duplicates were removed through the program EndNote Web, and articles selected through Rayyan. Thus, we verified that the normative values found for the 6-minute walk test in this population are close to those of other populations with some frailty, indicating that the normative values of the 6-minute walk test can be used in the clinical and practical context for purposes comparative tests and that the test can be applied as an efficient alternative to assess cardiorespiratory fitness in conditions where ergospirometry is not feasible.

ID: 5459

Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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### **AT1 RECEPTOR BLOCKADE DOES NOT REDUCE ARTERIAL PRESSURE OR INTRACRANIAL PRESSURE IN RENOVASCULAR HYPERTENSIVE RATS WITH 0.3 M NaCl AD LIBITUM**

Previous studies of our laboratory (Hypertension. 2021; 77:1311-1322) showed that renovascular hypertensive rats have increased intracranial pressure (ICP) and a decrease in P2/P1 ratio, which indicates a reduction in cerebral compliance. These responses are all reverted by AT1 receptors blockade with iv losartan (AT1 receptor antagonist). Since 2K1C rats display enhanced sodium intake and rats with high-sodium diet have a decreased cerebral blood flow, in the present study we aimed to study the

effects of AT1 receptors blockade with losartan (10 mg/kg iv) on arterial pressure, ICP and P2/P1 ratio in 2K1C rats with 0.3 M NaCl ad libitum. CEUA: 09/2021. Male Holtzman rats (initial weight 150 – 180 g) received a silver clip around the left renal artery to induce hypertension (2K1C; n = 4). 2K1C rats had water and 0.3 M NaCl bottles and standard rat chow ad libitum. Six weeks after the renal surgery, rats received an arterial catheter into the femoral artery and vein. On the next day, mean arterial pressure (MAP), ICP and P2/P1 were recorded in rats under urethane anesthesia (1.2 g/kg iv). ICP was evaluated using invasive (CODMAN 77023; Millar Instruments, Inc, Houston, TX) and noninvasive (BRAINCARE PICNI01 BcMM 2000; Braincare Corp, São Carlos, Brazil) monitoring sensors. The baseline levels of MAP, ICP and P2/P1 ratio in 2K1C-Na rats ( $179 \pm 9.32$  mmHg,  $14.13 \pm 3.11$  mmHg and  $1.58 \pm 0.13$ , respectively). Although saline and losartan did not change MAP ( $179 \pm 10.1$  and  $176 \pm 10.7$  mmHg, vs. baseline;  $p > 0.05$ ), there was a decrease in P2/P1 ratio after losartan ( $1.28 \pm 0.1$ , vs. baseline or saline;  $p < 0.05$ ). These data suggest a resistance to treatment with losartan for the hypertension IN 2K1C-Na rats, however, it seems that losartan was effective in decreasing the P2/P1 ratio, suggesting a beneficial effect on brain compliance.

ID: 5460

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de Santa Catarina (UFSC)

### **IMPROVED MATERNAL CARE INDUCED BY GESTATIONAL VITAMIN D DOES NOT ATTENUATE THE OFFSPRING IMPAIRED NEURODEVELOPMENT CAUSED BY OVEREXPOSURE TO DEXAMETHASONE IN RATS**

The overexposure to glucocorticoids (GC) during gestation alters the neurochemistry of the fetal brain. Vitamin D has been used to attenuate the negative effects of GC. We aim to investigate whether gestational vitamin D (GVD) can attenuate the effects of prenatal dexamethasone (PD) on the maternal care and the offspring neurodevelopment. Dexamethasone (0.1mg/kg, orally) was given to dams during the final third of pregnancy and vitamin D (500IU/day, orally) or vehicle was administered during the whole pregnancy. The offspring were divided into 4 groups (n=7-10): CTL, DEX, VD and DVD. Maternal care and emotional behaviors as well as the offspring development were evaluated during lactation. Differences were considered statistically significant if  $p < 0.05$ . Ethics Committee protocol n° 7174170417. The GVD led to a general improvement of maternal care, independently of dexamethasone exposure ( $970 \pm 254$  vs  $1295 \pm 289$ ;  $919 \pm 362$  vs  $1189 \pm 113$ ). The GVD increased the percentage of time ( $14 \pm 9$  vs  $31 \pm 1$ ;  $16 \pm 1$  vs  $15 \pm 1$ ) and the frequency of entries ( $21 \pm 1$  vs  $31 \pm 8$ ;  $23 \pm 6$  vs  $18 \pm 1$ ) in the open arms of the elevated plus maze and PD blunted these parameters. Concerning the offspring development, PD led to earlier eye opening compared to controls ( $15 \pm 0.5$  vs  $14 \pm 0.4$ ;  $14 \pm 0.5$  vs  $13 \pm 0.7$ ) and GVD did not affect this parameter. Moreover, GVD did not alter the righting (RR) and negative geotaxis (NG) reflexes. However, the male ( $2 \pm 0.8$  vs  $3 \pm 1.7$ ;  $2 \pm 1$  vs  $4 \pm 1.7$ ) and the female ( $2 \pm 1.4$  vs  $3 \pm 0.9$ ;  $1 \pm 0.2$  vs  $3 \pm 0.9$ ) offspring prenatally exposed to dexamethasone were slower on the RR test compared to their respective controls. Only the female offspring exposed to PD were slower to manage the NG compared to their respective controls ( $22 \pm 6$  vs  $28 \pm 2$ ;  $22 \pm 7$  vs  $28 \pm 2$ ). Our data indicate that the improvement of maternal care induced by GVD does not appear to mitigate the neurodevelopment delay induced by prenatal overexposure to dexamethasone in male and female rats.

ID: 5461

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### WHOLE-BODY ELECTROMYOSTIMULATION: REVIEW

Neuromuscular electrostimulation Training (NMS) has been discussed as a tool in combating physical inactivity, the junction between neuromuscular stimuli associated with increased physical activity level and improvement in status. Have gained attention from the world's population. Thus, the objective of this study is to review the studies already published on Neuromuscular electrostimulation (NBS) and how this influences the physical conditioning with its variables. The searches were performed in order to find articles conducted with humans in the last 10 years, on the subject that approached the method under discussion and quoted parameters used, as well as related to responses on body composition and physical conditioning. 933 articles were found in a primary way. After deleting the duplicates, they were 167. Of these, 93 were excluded after reading the titles and summary and 61 after reading in full, totaling ten articles to participate in the study. There are still no national parameters to achieve improvement in body composition using this method although most studies use the parameters with 85hz frequency, 350  $\mu$ s and time on 4 to 6 seconds and time off 4 to 6 seconds with total duration of the training session 20 minutes. It was possible to identify that this tool can positively alter the body composition.

ID: 5462

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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### MOMETASONE FUROATE: SYSTEMIC ADMINISTRATION OUTCOMES ON ANTI-INFLAMMATORY ACTIVITY AND ADVERSE METABOLIC EFFECTS

Glucocorticoids in excess result in adverse metabolic effects. Mometasone furoate (MF) is a second-generation GC that seems to act through binding not only to the glucocorticoid receptor but also to the Farnesoid X receptor (FXR). Considering FXR signaling may have a less adverse impact upon glucose metabolism and that MF is not fully explored in systemic vials, we aimed to evaluate the impact of nanoemulsions containing MF (Nano MF) in the glucose homeostasis of rats. Three-month-old adult male and female Wistar rats were used (200-500 g), and all protocols were approved by the institutional committee (5012250518). Anti-inflammatory actions of Nano MF (1 mg/kg body mass (b.m.) through oral gavage (o.g.)) were evaluated with carrageenan-induced peritonitis. Metabolic effects were investigated after subchronic treatment (o.g.). Intraperitoneal (i.p.) glucose and insulin tolerance tests were done on the sixth and seventh day of treatments, respectively. Euthanasia and tissue sampling were done the day after the last treatment. Either 1- or 2-way ANOVA was applied for multiple comparisons of parametric data and Kruskal–Wallis when data were nonparametric. The significance level adopted

was  $P < 0.05$ . Oral MF prevented leukocyte migration in both male and female rats, being as effective as dexamethasone. Oral MF treatment resulted in glucose intolerance in males but not in female rats, irrespective of the formulation administered. The i.p. tolerance test revealed that male and female rats treated with MF exhibited lower insulin sensitivity, irrespective of the formulation administered. Systemic delivery of MF reproduces the anti-inflammatory effect of dexamethasone and results in insulin insensitivity and glucose intolerance, being the last predominant in male rats. These results support the systemic delivery of MF for anti-inflammatory purposes, but additional studies merit investigation to compare the metabolic MF impact with those known to be caused by dexamethasone.

ID: 5463

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### KINETIC DIFFERENCES BETWEEN CARDIAC AND VENTILATORY RESPONSES DURING CLAMPED OXYGEN DESATURATION OVER TIME

Hypoxia increases heart rate (HR) and ventilation (VE) through peripheral chemoreflex stimulus. However, whether hypoxia time effects on HR and VE responses are equal remains unknown. We evaluate cardiorespiratory responses during clamped oxygen saturation ( $SpO_2$ ) over time. Ten participants (six men and four women:  $26 \pm 4$  ys;  $72 \pm 10$  kg) were exposed to 10 min of normoxia and then 40 min with a clamped  $SpO_2 \sim 84\%$ . The cardiorespiratory variables HR, VE and  $SpO_2$  were measured by an EKG, spirometry and pulse oximetry, respectively. Spectral analysis of the R-R intervals was carried out in five segments of 10 min each: normoxia (N10') and then hypoxia: 10 min (H10'), 20 min (H20'), 30 min (H30') and 40 min (H40'). One-way ANOVA for repeated measures with Fisher's post-hoc was employed. All participants signed consent term (CEP:1.252.971/2015).  $SpO_2$  was clamped over time under hypoxic condition ( $SpO_{2\_H10'}$ :  $86 \pm 3$ ;  $SpO_{2\_H20'}$ :  $83 \pm 1$ ;  $SpO_{2\_H30'}$ :  $84 \pm 2$ ;  $SpO_{2\_H40'}$ :  $84 \pm 2$  vs.  $SpO_{2\_N10'}$ :  $96 \pm 1$ [%];  $p < 0.0001$ ). HR increased ( $HR\_H10'$ :  $84 \pm 12$ ;  $HR\_H20'$ :  $82 \pm 13$ ;  $HR\_H30'$ :  $81 \pm 13$ ;  $HR\_H40'$ :  $83 \pm 12$ ) vs. normoxia ( $HR\_N10'$ :  $77 \pm 12$  [bpm];  $p < 0.01$ ) and vagal modulation decreased over time under hypoxia ( $HF\_H10'$ :  $6.13 \pm 1.05$ ;  $HF\_H20'$ :  $6.30 \pm 0.87$ ;  $HF\_H30'$ :  $6.36 \pm 1.17$ ;  $HF\_H40'$ :  $6.20 \pm 1.07$  vs.  $HF\_N10'$ :  $6.92 \pm 0.88$  log[ms<sup>2</sup>];  $p < 0.05$ ). Also, VE increased over hypoxic time by growing increments in tidal volume ( $Vt\_H10'$ :  $0.984 \pm 0.234$ ;  $Vt\_H20'$ :  $0.959 \pm 0.231$ ;  $Vt\_H30'$ :  $0.989 \pm 0.237$ ;  $Vt\_H40'$ :  $1.046 \pm 0.326$  vs.  $Vt\_N10'$ :  $0.888 \pm 0.206$  [L];  $p < 0.05$ ), while the breathing rate was unchanged. The present data show that during clamped  $SpO_2$ , VE has grown up over time, while HR increased but remained constant, following vagal withdrawal. In conclusion, time effects occur only in the ventilatory response in acute clamped oxygen desaturation.

ID: 5464

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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*Instituições: Universidade Federal do Rio de Janeiro (UFRJ)*

### **USE OF DIGITAL MEDIA AS A TOOL FOR UNIVERSITY EXTENSION ACTIONS OF THE HUMAN BODY IN ACTION PROJECT**

In times of pandemic, university extension actions have adapted to fulfill their social role. Social media showed creativity and innovation to continue projects and disseminate shared knowledge to the community. The aim of this work is to measure the interaction between the networks used. The activities are developed by the social network: Instagram. Being: live activities and informative post observed. Likes were analyzed over two months, totaling 219 reactions. The live activities by the UFRJ Extension Youtube Channel were: Recorded Activities with 65 views, and Anatomy behind the story with 64 views, in addition to participation in science fairs with the participation of approximately 130 students. Therefore, digital media support the dissemination of the project, which expands knowledge in anatomy and spreads curiosities inherent to the subject.

*ID: 5465*

*Área: Fisiologia de Órgãos e Sistemas: Endócrina*

*Forma de Apresentação: Ê-POSTER*

*Autores: Tito Mafra, Thais Cardoso, Tamires Marinho, Paola Fernandes, Nayara Horta, Maristela Poletini*

*Instituições: Universidade Federal de Minas Gerais (UFMG)*

### **LIVER CLOCK GENES IS MODULATED BY ESTRADIOL IN A TIME-OF-DAY MANNER IN FEMALE RATS**

Clock genes in the liver directly regulates glucose homeostasis, which contributes to the maintenance of glucose levels during fasting. On the other hand, estradiol regulates food intake and insulin resistance. Thus, the present study investigated the role of estradiol (E2) in the expression of clock genes in liver. To that end, adult Wistar rats went through SHAM or ovariectomy surgery (OVX). After 7-10 days, OVX rats were subcutaneously treated with corn oil (0.2 mL) or cypionate of estradiol (E2, 10 µg / 0.2 mL) for three consecutive days and were then euthanized at zeitgeber time (ZT) 1 and ZT13 in the next day for collecting liver. Body weight was measured. The expression of the clock genes Per1, Bmal1, Revorbα, Cry1 and Cry2 was performed by qRT-PCR (CEUA protocol nº117/2018). OVX rats gained more weight than did the SHAM rats and E2 reduced the body weight gain. OVX rats presented higher levels of Per1, Bmal1, Cry1 e Cry2 mRNA expression compared to SHAM at ZT1. E2-treatment reversed the OVX-induced increasing in Per1, Bmal1, Cry1 e Cry2 but it did not alter the mRNA levels of Revorb-α gene. No differences were found among groups at ZT13. In conclusion, ovarian hormones contribute for the maintenance of clock genes mRNA levels in liver in a time-of-day specific manner. Estradiol seems to be responsible for this maintenance. These results may contribute to the understanding of metabolic alterations caused by the decrease or absence of ovarian hormones like the increase in body weight gain and the impairment in the glucose metabolism commonly observed during menopause.

ID: 5466

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de Pernambuco (UFPE)

### **OMEGA-3 ENRICHMENT ATTENUATES CARDIOMETABOLIC DISORDERS ELICITED BY MATERNAL DIET RICH IN SATURATED FATTY ACIDS IN YOUNG ADULT RAT OFFSPRING**

Maternal diet rich in saturated fatty acids (SFA) during pregnancy and lactation can cause chronic disease in the adult life of the offspring. We hypothesize that enrichment with omega-3 ( $E\omega 3$ ) in diet SFA-rich attenuates its effects on cardiometabolic parameters. We aimed to evaluate the repercussions of the SFA-rich maternal diet and  $E\omega 3$  on cardiometabolic parameters of adult offspring. After pregnancy detection, Wistar rats ( $\cong 250g$ ) were divided into 3 groups: C (19% lipids- LP), HF (LP 33%) and HF $\omega 3$  (33% lp,  $E\omega 3$ ) during pregnancy and lactation. At 90 and 300 days, murinometric measurements were evaluated in the offspring of males, they were also submitted to fasting blood collection for biochemical analysis and the parameters of respiratory frequency, tidal volume and ventilation were acquired through plethysmography. At these ages, a catheter was also implanted in the femoral artery and hemodynamic values were recorded. Data expressed as mean  $\pm$  SEM. Groups compared by one-way ANOVA considering  $p < 0.05$ . Protocols approved by CEUA No. 23076.049500/2016-37. No statistical differences were found in murinometric and ventilatory values. At 90 days, HF had higher GLY ( $142 \pm 3mg/dL$ ), TGL ( $110 \pm 5mg/dL$ ) and VLDL ( $22 \pm 1mg/dL$ ) and HF $\omega 3$  lower AST ( $115 \pm 3U/L$ ) and AST/ALT ( $2.5 \pm 0.08$ ). At 300 days, HF and HF $\omega 3$  higher CT (HF= $87 \pm 2$ , HF $\omega 3$ = $88 \pm 2mg/dl$ ), TGL (HF= $83 \pm 4$ , HF $\omega 3$ = $86 \pm 5$ ) and VLDL (HF= $16 \pm 0.8$ , HF $\omega 3$ = $16 \pm 1.2$ ), and lower AST (HF= $139 \pm 9$ , HF $\omega 3$ = $114 \pm 5$ ) and AST/ALT (HF= $2.4 \pm 0.2$ , HF $\omega 3$ = $1.9 \pm 0.1$ ). HF had higher MAP ( $132 \pm 2mmHg$ ) and SBP ( $163 \pm 4mmHg$ ) at 90 days and at 300 HF and HF $\omega 3$  higher MAP (HF= $111 \pm 3$ , HF $\omega 3$ = $116 \pm 2$ ) and SBP (HF= $138 \pm 2$ , HF $\omega 3$ = $137 \pm 5$ ). Our study suggests that the cardiometabolic alterations found are due to the SFA-rich maternal diet. Although the  $E\omega 3$  has been shown to attenuate these alterations in young adult offspring, apparently in this experimental condition the impair in lipid profile and blood pressure caused by the SFA-rich diet overlaps the  $E\omega 3$  effects at 300 days.

ID: 5468

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal do Pampa (UNIPAMPA)

### **NORADRENERGIC NEURODEGENERATION CAUSES SOCIAL RECOGNITION MEMORY DEFICITS THAT WERE NOT PREVENTED BY THE ASSOCIATION OF COGNITIVE AND PHYSICAL TRAINING**

Various neurodegenerative diseases start causing early neurodegeneration in brain stain structures such

as Locus Coeruleus (LC). Evidence suggests that neuroprotective strategies could be used to stimulate neuroplasticity and prevent or avoid cognitive deficits. This research aimed to verify the effect of an association of cognitive and physical training - a multicomponent training (MT) on the social recognition memory of animals with neurodegeneration in LC. Thirty-eight male adult Wistar rats were divided into 2 groups: Control (C) and MT Group. MT was performed 6x/week for 8 weeks. The animals were trained in aerobic, strength, and cognitive exercise alternately, with each modality performed 2x/week. After that, the animals were submitted to LC neurodegeneration induction by infusion of 6-OHDA, a neurotoxic drug, in LC. Previously to drug infusion, the animals received GBR- 12909 to protect dopaminergic neurons. In the end, we obtained 4 groups: (i) C+sham surgery, (ii) C+6OHDA, (iii) MT+sham, and (iv) MT+6OHDA. All animals were trained in social recognition (SR) memory task and tested 24h after, introducing a familiar and a novel animal in the same apparatus. The time spent exploring each one was measured and converted in percentual of total exploration time. The Ethics Committee for the Animals' Use from Unipampa approved this study (protocol 004/2020). Data were analyzed by a one-sample t-test, considering a theoretical mean of 50%. P was considered significant when  $< 0.05$ . In the SR test, we observed that the animals from the group (i) explored more than 50% of the time the novel animal, demonstrating normal memory ( $P < 0.0001$ ), while the animals from the group (ii) no ( $P = 0.051$ ). MT did not affect the results. Animals from group (iii) were able to learn ( $P = 0.0009$ ), while animals from group (iv) no ( $P = 0.3195$ ). This set of results allow us to conclude that noradrenergic neurodegeneration causes social recognition memory deficits that were not prevented by the association of cognitive and physical training in an MT.

ID: 5469

Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

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### **EFFECTS OF THE TYPE OF HIGH-FAT DIET ASSOCIATED WITH PHYSICAL EXERCISE ON THE ADIPOSE TISSUE OF RATS**

High-fat diets (HFD) have been associated to obesity and for that it has been used in several experiments, in humans and rodents. Adipocytes are cells found in the adipose tissue coxins of the intraperitoneal cavity (IC), mesenteric (Mes), periuterine (P), and brown adipose tissue (M) undergoing modifications. The aim of this study is to evaluate the effects of different sources of HFD fat associated with physical training (FT) on the adipose tissue of female rats. This research was approved by the Animal Experimentation Ethics Committee CEEA/UERN (n° 007/19). Twenty-oneday-old female Wistar rats ( $n = 48$ ) (~130g), with food and water provided ad libitum, were submitted to (FT) for 3 months. The animals were distributed into 6 groups according to their diet and FT: G1-standard and sedentary diet; G2-HFD with lard and sedentary; G3-HFD with cashew nuts and sedentary; G4-standard diet and FT; G5-HFD with lard and FT and G6-HFD with cashew nuts and FT. The exercises were performed on the treadmill 40 min/d x 5 days/wk with training at 65% of  $V_{max}$ . After euthanasia, adipose pads from were collected, weighed and stored. Data were normally distributed, and variances were homogeneous. To verify the effect of diet and exercise on the weight of fat pads, two-way ANOVA was performed followed by Tukey's multiple comparison test. The significance level adopted was  $\alpha \leq 0.05$ . ANOVA showed an effect of diet on IC [ $F_{2,42}(6.857; p = 0.003)$ ] and P [ $F_{2,42}(5.014; p = 0.011)$ ] adipose tissue. There was no effect of FT in any of the analyzed fat pads. The post hoc showed differences

between the two HFDs in relation to the standard ( $p < 0.05$ ), but there was no difference in the weight of adipose tissue IC and P, in relation to the sources of the HFD ( $p > 0.05$ ). In conclusion, the results suggest that HFD, regardless of the fat source used, caused differences in the weight of fat pads in the IC and P regions and that FT was not able to change the effects caused by the consumption of the diet.

*ID: 5470*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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### **CORRELATION BETWEEN HEART RATE VARIABILITY AND OBSTRUCTIVE SLEEP APNEA SEVERITY INDICES**

Obstructive sleep apnea (OSA) is a common sleep disorder that affects almost 1 billion people worldwide, but with an elevated rate of underdiagnosis, which contributes to the development of comorbidities, including cardiac autonomic imbalance leading to high cardiac risk. Heart rate variability (HRV) indices represent a non-invasive tool that provides valuable information regarding the modulation of cardiac function and cardiovascular risk. This study aims to seek a relationship between HRV indices and the presence and severity of OSA. Electrocardiogram was extracted from 157 polysomnographic exams realized in the University Hospital of FMRP/USP (Protocol 42058720.6.000.5440 / 4.550.2327), which classified patients as OSA-free (N=26) or with its mild (N=39), moderate (N=37), or severe form (N=55). Series of RR intervals were generated in segments of 15 min/h during 6h of sleep (one for each hour). HRV indices were calculated for each segment and averaged for each patient. Linear and non-linear HRV methods were employed, namely time- and frequency-domain, symbolic analysis, sample entropy, and detrended fluctuation analysis (DFA), totalizing 12 indices. LF/HF ratio from spectral analysis, percentage of 0V from symbolic analysis, and DFA  $\alpha 1$  increased, while 2UV and SampEn reduced with the increase of OSA severity. Moreover, LF/HF ratio, SampEn, and DFA  $\alpha 1$  were significantly correlated to all PSG severity scores analyzed (apnea-hypopnea index-AHI, microarousal index-MI, percentage of total sleep time with oxygen saturation below 90%, and oxygen saturation nadir). DFA  $\alpha 1$  was the index that showed the highest correlation with AHI ( $R=0.30$ ), but, in general, higher correlations were obtained for the MI, where 2UV showed the highest one ( $R=-0.35$ ). Our results show that the HRV can bring valuable information about OSA presence and severity, suggesting that HRV indices can be helpful in a quick diagnosis of OSA, potentially reducing the development of comorbidities.

*ID: 5471*

*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Federal do Pampa (UNIPAMPA)*

## A MULTICOMPONENT TRAINING AVOIDS LONG-TERM AVERSIVE MEMORY DEFICITS RELATED TO LOCUS COERULEUS EARLY NEURODEGENERATION

Alzheimer's disease neurodegeneration starts early, causing neurodegeneration in structures such as Locus Coeruleus (LC). Neuroprotective strategies can be used to stimulate neural plasticity and avoid cognitive deficits. The objective of this work was to analyze the effects of multicomponent training on long-term aversive memory of rats induced early neurodegeneration in LC. First, 38 male Wistar rats (3 months/300-350g) were divided into 2 groups: Control and Multicomponent Training (MT) Group. Multicomponent training was performed 6x/week for 8 weeks and involved aerobic and strength physical exercise, and cognitive exercise, performed alternately, 2x/week each. After that, the animals were submitted to LC neurodegeneration induction by 6-OHDA infusion in LC through stereotaxic surgery. 6-OHDA is a neurotoxin that destroys noradrenergic neurons (dopaminergic neurons were protected by previously infusion of GBR 12909). So, we obtained 4 groups: (i) no intervention (NI) + sham, (ii) NI + 6OHDA, (iii) MT + sham, and (iv) MT + 6OHDA. To test the aversive memory, the inhibitory avoidance (IA) task was used. 24 h after IA training, the long-term memory was tested, and the step-down IA platform latency was measured. This study was approved by the Ethics Committee for Animals' Use from Unipampa (004/2020). The data were analyzed using twoway ANOVA. Significance was considered when  $P \leq 0.05$ . We found a main effect of 6-OHDA ( $F(1.33) = 22.89$ ,  $P = 0.0001$ ), and of MT ( $F(1.33) = 5.158$ ,  $P = 0.029$ ), without interaction between the factors ( $F(1.33) = 1.179$ ,  $P = 0.285$ ). Multiple comparison tests show differences between groups (i) and (ii) ( $P < 0.001$ ), but no differences between groups (i) and (iv) ( $P > 0.05$ ). Therefore, 6-OHDA promoted aversive memory deficit, which MT avoids.

ID: 5472

Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

Autores: *Amanda Almeida, Thiago Correa, Maiara Dias, Douglas Batista, Rafael Pereira, Amélia Gusmão*  
Instituições: *Universidade Federal da Bahia (UFBA)*

## COMPARISON OF CARDIOVASCULAR ADAPTATIONS INDUCED BY DIFFERENT TRAINING PROGRAMS IN WISTAR MALE RATS

Exercise-induced adaptations may vary according to the physical training design (type, intensity, duration, weekly frequency, distribution). Therefore, this study aimed to investigate the cardiovascular adaptations (resting blood pressure and heart rate, and aerobic capacity) in rats trained with linear and polarized training program. Eighteen male Wistar rats (300-350g; 4-months old) were allocated into 3 groups (6/group): sedentary (SED), trained in a linear program (LIN) and trained in a polarized program (POL). Training sessions were carried out in alternate days for 4 months. LIN ran for 60 min at 60% of maximum aerobic capacity (MAC) in all training sessions, while POL ran for 90 min at 45%, 45 min at 80%, and 60 min at 60% of MAC, in 80%, 15% and 5% of training sessions, respectively. The monthly training volume (load x duration of each session) was matched for trained groups. The MAC was evaluated monthly through a treadmill and used to physical performance measure and to adjust the training parameters for each animal. Systolic (SBP), diastolic (DBP) and mean (MBP) blood pressure, and heart rate (HR) were measured using the tail plethysmography method before and after experimental period. This study was approved by the IMS-UFBA CEUA (no 088/2020). ANOVA two-way was used to compare group x time effect, with significance level at  $p < 0.05$ . MAC improved significantly in trained groups along the training period and was higher than SED (SED  $9.7 \pm 0.4$ ; LIN  $15.4 \pm 1.6$ ; POL  $15.0 \pm 1.7$ ). LIN and POL exhibited significantly lower SBP (SED  $127 \pm 5$ ; LIN  $121 \pm 6$ ; POL  $120 \pm 6$ ) and MBP (SED  $102 \pm 3$ ; LIN  $99 \pm 4$ ; POL  $97 \pm 4$ ) than SED, but DBP were significantly different between SED

and (SED 90±4; LIN 88±5; POL 86±5) and HR (SED 352±28; LIN 352±29; POL 349±29). Four months of physical training induce benefit adaptations in MAC, SBP and MBP, regardless of training program design, which could be explained by the matched training volume for our trained groups.

ID: 5473

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

Autores: Raquel Castro, Rafael Moreira, Cátia Vieira, Fátima Ferreirinha, Moisés Tolentino, Paulo Correia-de-Sá

Instituições: Instituto de Ciências Biomédicas Abel Salazar (ICBAS), Porto, Portugal; MedInUP Research Fellowship

### INFLAMMATORY SHIFT BETWEEN IONOTROPIC P2X4 AND P2X7 PURINOCEPTORS CONTROLS VAGAL MODULATION IN RAT ILEITIS

The therapeutic potential of vagal nerve stimulation for inflammatory bowel diseases (IBDs) has been recently reviewed (Bonaz et al, 2021; 10.3389/fnins.2021.650971). The anti-inflammatory vagal effect result from activation of the hypothalamic-pituitary-adrenal axis and via the release of acetylcholine (ACh), which inhibits TNF $\alpha$  by macrophages. Yet, cholinergic neurotransmission is severely affected in ileitis, even if no depletion of vagal parasympathetic nerves is observed (Vieira et al, 2014; 10.1155/2014/254640). The unbalance between physiological adenosinergic neuromodulation and excessive ATP release (“danger molecule”) by inflammation-induced enteric gliosis may be critical (Vieira et al., 2017 doi: 10.3389/fphar.2017.00811). Here, we investigated the role ATP-sensitive P2X4 and P2X7 receptors often operating neuro-immune interactions in rats with TNBS-induced ileitis. Sub-diaphragmatic vagotomy (VGX) decreased [3H] ACh release from electrically-stimulated longitudinal muscle / myenteric plexus of the ileum of control and TNBS-treated rats. Inflammation increased the TTX (1  $\mu$ M)-resistant non-neuronal component of [3H] Ach release (0.49±0.06) compared to healthy controls (0.26±0.02). Blockage of the P2X7 receptor with A438079 (3  $\mu$ M) decreased [3H] ACh release from myenteric neurons of TNBS-treated rats, but not from controls. Conversely, the P2X4 receptor antagonist, 5-BDBD (10  $\mu$ M) reduced nerve-evoked [3H] ACh release, while the P2X4 receptor positive allosteric modulator, ivermectin (30  $\mu$ M), increased the basal outflow of the transmitter in controls rats. The presence of P2X4 and P2X7 receptors in VAcHT-positive cholinergic nerve terminals and in S100b-positive enteric glial cells was demonstrated by confocal microscopy. The mechanisms underlying the differential activation of P2X4 vis a vis P2X7 receptors that may foster non-neuronal [3H] ACh release after an inflammatory insult, requires further investigations.

ID: 5474

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal da Bahia (UFBA)

## **IMPACTS OF LOW- AND MODERATE-INTENSITY TRAINING ON INTRINSIC APOPTOSIS PATHWAY MARKERS IN A MODEL OF CISPLATIN-INDUCED NEPHROTOXICITY**

The intrinsic pathway of apoptosis is involved in cisplatin (CP)-induced acute kidney injury (AKI). The aim of this study was to compare the effects of low- and moderate-intensity exercise on intrinsic pathway markers of apoptosis in female rats with CP-induced AKI. Thus, 24 rats were divided into 4 groups (n=6): C+S, sedentary control; CP+S, cisplatin and sedentary; CP+LIT, cisplatin and light intensity training (LIT) (55% of the maximum capacity); CP+MIT, cisplatin and moderate intensity training (MIT) Ethics Committee in Animal Experimentation of the UFBA/IMS (protocol 056.2018) (70% of the maximum capacity). Both training protocols consisted in running on treadmill, 5 days/week, for 8 weeks. In the end of the training protocols, the CP+S, CP+LIT and CP+MIT groups received a single dose of CP (5 mg/kg, i.p.), and 07 days later they were euthanized. The gene expression of Bax, Bak and Bcl-2 were analyzed in renal tissue by quantitative realtime polymerase chain reaction. Data are presented as mean±SD. Statistical differences were defined when  $p < 0.05$ . All groups treated with CP showed increased gene expressions of Bax and Bak compared to the control (Bax:  $0.87 \pm 0.46$ ; Bak:  $0.96 \pm 0.14$ )  $p < 0.001$  and although LIT (Bax:  $51.71 \pm 4.26$ ; Bak:  $27.82 \pm 1.08$ ) reduced these expressions compared to CP+S (Bax:  $75.94 \pm 6.45$ ; Bak:  $31.54 \pm 1.31$ )  $p < 0.001$ , this effect was greater in MIT (Bax:  $41.78 \pm 3.03$ ; Bak:  $19.73 \pm 0.90$ )  $p < 0.001$ . On the other hand, the trained groups showed increased expression of Bcl-2 CP+LIT ( $17.55 \pm 0.69$ ) and CP+MIT ( $21.50 \pm 1.68$ )  $p < 0.001$  compared to the C+S ( $1.09 \pm 0.48$ ) and CP+S ( $12.77 \pm 2.29$ )  $p < 0.001$ , with MIT having a superior effect. Both the CP+LIT group ( $2.96 \pm 0.30$ ) and the CP+MIT group ( $1.96 \pm 0.26$ ) showed a lower Bax/Bcl-2 ratio compared to the CP+S group ( $6.15 \pm 1.49$ )  $p < 0.001$ . In conclusion, although both training protocols produced renoprotective effects, greater benefits were achieved with MIT, reducing the Bax / Bcl-2 ratio more than with LIT.

ID: 5475

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER - Prêmio Branca

Autores: Maycon Ferreira, Tânia Shecaira, Gabriel Silva, Michel Silva, Nathalia Bernardes, Danielle Dias, Débora Kimura, Maria Irigoyen, Guiomar Gomes, Kátia de Angelis  
Instituições: Universidade Federal de São Paulo (UNIFESP)

## **ENALAPRIL PLUS EXERCISE TRAINING, BUT NOT ENALAPRIL ALONE, ATTENUATES HYPERTENSION-ASSOCIATED SYMPATHETIC OVERACTIVITY: IMPACT ON RENAL DAMAGE IN A MENOPAUSE MODEL**

Sympathetic tone increased in hypertension has been associated with organ damage and morbimortality. Here, we evaluate the effects of enalapril maleate (E) combined or not with concurrent exercise training (CET) on neurohumoral mechanism of blood pressure (BP) control and renal damage in a model of menopause. After approval by the animal ethics committee (nº7611290618), female spontaneously hypertensive rats (90 days old, 150-180g) were allocated (7-8 animals/group) into sedentary (S) and ovariectomized groups: sedentary (OS), sedentary treated with E (OSE) and trained treated with E (OTE). Enalapril (3mg/kg) was dissolved in the drinking water. CET (3 days/wk for 8 weeks) consisted of aerobic followed by resistance exercises. Heart rate and BP variability were analyzed after direct recording of BP. Vasopressin receptor antagonist, losartan and hexamethonium were sequentially injected to evaluate the vasopressor systems. Kidneys histological and functional parameters were evaluated. OSE and OTE showed lower systolic (mmHg) (OSE:  $168 \pm 6$ ; OTE:  $169 \pm 16$ ) and mean BP (OSE:  $147 \pm 6$ ; OTE:  $148 \pm 14$ ) compared with S (SBP:  $196 \pm 20$ ; MBP:  $167 \pm 16$ ) and OS (SBP:  $205 \pm 15$ ;

MBP:176±16). Bradycardia (bpm) was observed only in trained group. In addition, OTE showed higher cardiac vagal modulation (RMSSD: OTE:8.5±1.6 vs OS:6.1±0.7ms; and high-frequency band: OTE:21.9±8.1 vs S:13.1±3.6 and OS:11.9±2.3ms<sup>2</sup>) and reduced low-frequency band of systolic BP (mmHg<sup>2</sup>) (OTE:8.0±4.1 vs S:16.8±6.4 and OS:16.6±7.7). Drop in BP (mmHg) after hexamethonium was lower in OTE (-54.2±8.4 vs OS:-78.1±23.5). Trained rats showed higher creatinine clearance (vs OS) and reduced tubulointerstitial lesions (vs OS and OSE). To date, we concluded that E plus CET is more efficient than E alone to promote autonomic adjustment due to a greater effect on sympathetic outflow, probably impacting on end-organ damage, as demonstrated by attenuation on hypertension-induced renal dysfunction in menopausal rats.

ID: 5476

Área: Fisiologia de Órgãos e Sistemas: Digestória

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Estadual Paulista (UNESP) - Faculdade de Odontologia de Araçatuba (FOA)

### **OXYTOCIN ACTION ON FEMALE RATS BONE METABOLISM AND GAIT QUALITY DURING THE AGING PERIOD**

Female aging is marked by a predisposition to osteoporosis and functional changes. The investigation of strategies, such as oxytocin (OT), in the period before menopause is important for prevention. In this study, the action of OT, its potential in preventing osteoporosis and gait changes during peristropause, was evaluated. Forty 19-months-old female Wistar rats (CEUA 00688-2018) received two injections (ip) 12 h apart every 30 days of saline solution (0.15mol/L, Veh), atosiban (AT) (300µg/Kg; At), OT (134µg/Kg; Ot) or At+Ot (AT and, 5 minutes later, OT). At the beginning and end of the treatment, the deambulation test was performed. At twenty-one months-old, femur was collected for analysis (mean ± SEM, p<0.05). Raman microspectroscopy, the mineral-to-matrix ratio was higher in the Veh and At; type-B carbonate was higher in Ot. The immunostaining of tartrateresistant acid phosphatase was lower and that of osteocalcin was higher in the cortical bone of the femoral neck after Ot administration. Histological analyses, the cortical thickness and trabecular bone number was higher in Ot group. In the femoral neck, the bone mineral density was higher in the At, Ot and At+Ot vs Veh, and Ot was higher than At and At+Ot. Cortical microtomography, the average cortical thickness was higher in the Ot and the cortical porosity was lower in the Ot vs At. In the polar moment of inertia, the Ot was higher than Veh and At. Three-point bending test, there was higher maximum load in the Ot compared to At and lower in the At+Ot when compared to Ot. There was higher stiffness in the Ot compared to Veh and At. Deambulation test, the final step length from Ot group was higher than final step length from Veh and At and initial step length from Ot. We conclude that endogenous OT plays an important role in the regulating bone remodeling during periestropause, and exogenous OT can be highlighted as a potential preventive intervention in this period for improving bone quality and gait.

ID: 5477

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER - Prêmio Álvaro

Autores: Stefanne Marques, José Menani, Débora Colombari, Gustavo Pedrino, Eduardo Colombari  
Instituições: Universidade Federal de Goiás (UFG)

## **A2 CATECHOLAMINERGIC NEURONS ARE ESSENTIAL FOR CARDIORESPIRATORY ADJUSTMENTS TO HYPOXIA IN RENOVASCULAR HYPERTENSION**

Recently it was demonstrated that renovascular hypertension depends on the carotid body integrity. The A2 noradrenergic neurons receive information from carotid body afferents, and mediate the ventilatory response to hypoxia in normotensive animals. However, the involvement of these neurons in the cardiovascular and respiratory modulations in rats with renovascular hypertension remains unknown. The present study examines the effects of A2 noradrenergic neurons lesions on the baseline of cardiovascular and respiratory parameters in unanesthetized 2K1C rats. Holtzman rats (weight 150-180 g) received a silver clip around the left renal artery to induce hypertension (n = 16). After three weeks, the animals were anesthetized to perform nanoinjections (100 nL) of anti-D $\beta$ H-saporin (0.105 ng · nl<sup>-1</sup>) in 2K1C-LA2 (n = 7) and SHAMLA2 (n = 8) or saline in 2K1C (n = 8) and SHAM (n = 5). After 3 weeks, baseline respiratory rate (fR), tidal volume (VT) and minute volume (VE) and after stimulation by hypoxia (7% O<sub>2</sub>) were recorded. The histological analysis showed nanoinjections of saporin anti-D- $\beta$ H reduced on average 69% of the neurons A2 in 2K1C-LA2 group and 67% of the neurons A2 in SHAM-LA2 group. In regarding pulmonary ventilation, only 2K1C-LA2 animals change in baseline parameters compared to 2K1C VT (2K1C-LA2: 4.39 ± 0.22 mL/Kg vs. 2K1C: 6.50 ± 0.49 mL/Kg) and VE (2K1C-LA2: 539.2 ± 47.7 mL/Kg/min vs. 2K1C: 851.5 ± 52.8 mL/kg/min). After the challenge with hypoxia change all groups at least one of the evaluated parameters, and the response to hypoxia of the 2K1C-LA2 animals was less compared to the 2K1C group VE (2K1C-LA2: 21.43 ± 4.41 %baseline vs. 2K1C: 50.42 ± 11.50 %baseline). Catecholaminergic A2 neurons play an important role both in regulating basal ventilation and in modulating this response during hypoxia.

ID: 5478

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER - Prêmio Branca

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## **ANALYSIS OF THE OXYTOCIN AND STRENGTH TRAINING, ASSOCIATED OR NOT, IN THE BONE LOSS PREVENTION DURING PERIESTROPAUSE**

This study evaluated the action of strength training (ST) associated or not with oxytocin (OT) on bone remodeling of the femoral neck of female rats in the period of spontaneous transition from regular to irregular cycle and to acyclicity, periropause. Forty female rats (CEUA 2018.1636.001566-2/2) with irregular estrous cycle (18 months) constituted the groups: Vehicle/Veh (NaCl 0.15M); Oxytocin/Ot (134 µg/kg); Strength training/St (3x/week); Ot+St. Veh, Ot and Ot+St received two injections (ip) 12 h apart every 30 days. After 120 days, femur and plasma were collected for analysis (mean ± SEM, p<0.05).

Higher gene expression (qRT-PCR) of the Runt 2 transcription factor in Ot, St and Ot+St vs Veh. Alkaline phosphatase (Alp) was higher in Ot and Ot+St. There was higher expression of tumor necrosis factor 11a (Rank) in St and Ot+St vs Veh and Ot; tumor necrosis factor ligand (Rankl) and osteoprotegerin (Opg) in Ot+St vs Veh, Ot and St. The mineralization rate analyzed by Raman spectroscopy was higher in St vs Veh and Ot. Cortical bone microtomography showed greater thickness (Ct.Th) and decreased number of pores (Po.N) in the Ot+St group; the mean polar moment (MMI<sub>polar</sub>) was greater in Ot+St vs Ot. In the trabecular region, there was greater bone volume (BV/TV) in Ot+St vs Ot and greater trabecular thickness (Tb.Th) in Ot+St compared to the other groups. The bone mineral density (BMD) of the femoral neck was higher in Ot+St vs Ot, and the total femoral BMD was higher in St vs Veh and in Ot+St compared to the other groups. In the mechanical compression test, there was greater maximum load in Ot+St vs Veh, greater elasticity in St vs Veh and Ot and lower elasticity in Ot+St vs St. Bone metabolism markers, tartrate resistant acid phosphatase (TRAP) activity was lower in Ot+St vs other groups. The combination of interventions is a promising anabolic strategy during periostropause for the prevention of osteoporosis, standing out from the effects of isolated treatments.

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Área: *Fisiologia Comparada*

Forma de Apresentação: Ê-POSTER

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### **ROLE OF SEROTONINERGIC NEURONS OF MEDULLARY RAPHE IN THE CONTROL OF THERMOGENESIS IN PRECOCIOUS BIRDS**

In vertebrates, serotonergic neurons are located almost exclusively in the raphe, being a neurotransmitter that plays an important role in numerous functions, such as the regulation of body temperature (T<sub>b</sub>). Recently we showed that medullary raphe plays a role in thermogenesis regulation in chicken chicks, but the nature of the neurons involved was not addressed. Thus, the aim of this study was to investigate the specific participation of serotonergic neurons of the medullary raphe in the thermogenesis of one-week-old chicks. To this end, animals received intracerebroventricular microinjection (fourth ventricle) of anti-SERT-SAP, which promotes specific chemical damage to 5-HT neurons, or vehicles (IGG-SAP and PBS), 7-8 days before the experiments. Body temperature was measured in chicks implanted with a mini temperature sensor in the coelomatic cavity, and oxygen consumption (index of thermogenesis) was determined using open-flow respirometry under neutral (31°C), cold (25°C) and warm (36°C) conditions for 2 hs. Protocols were approved by the local Animal Care and Use Committee (CEUA of FCAV/Unesp, nº 013907/17). Anti-SERT-SAP was effective in deleting about 70% of serotonergic neurons. Under neutral, cold and warm conditions, the animals that had damaged the serotonergic neurons showed no differences in any of those parameters. Our preliminary results suggest that serotonergic neurons of medullary raphe may not be involved in thermogenesis in precocious birds.

ID: 5480

Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: Ê-POSTER

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### **CONTRACTIONWAVE: DENSE OPTICAL FLOW SOFTWARE TO QUANTIFY CELLULAR CONTRACTILITY**

**Introduction:** Quantification of cardiomyocyte contractility is an essential biomedical task and a key step in understanding the mechanisms involved in the pathogenesis of cardiac disease. However, accurate and reproducible measurements are hampered by several factors inherent to the software options currently available. **Objective:** To provide an innovative method for quantifying cardiomyocyte biomechanics through robust open-source software. **Methodology:** Cell images were obtained from bright field microscope, and processed by Dense optical method. To validate the software efficiency, we exposed male adult (12 weeks), neonatal (1-3 days) and Human-induced pluripotent stem cell-derived cardiomyocytes (hiPSCM) to drugs known to affect contractility (Isoproterenol or Verapamil). Statistical analysis was performed using ANOVA and Test t student, using  $p < 0.05^*$ , CEUA-UFMG 138/2018. **Results:** We developed CONTRACTIONWAVE (CW), an open-source software written in Python language that combines in a single platform a robust method to acquire, visualize, analyze, and quantify contractility parameters of cardiac cells at different developmental stages. Adult and Neonatal cardiomyocytes (CMs), treated with ISO or VERA, showed a significant decrease in Contraction Time, Relaxation and Total Contraction-Relaxation (ms). Only cells treated with VERA showed a decrease in the Maximum Contraction Speed ( $\mu\text{m/s}$ ) and Maximum Relaxation Speed ( $\mu\text{m/s}$ ) while the ISO increased. Likewise, ISO and VERA induced opposite effects in the shortening area ( $\mu\text{m}^2$ ). CMs from a hypertension model showed an increase in contraction time. **Conclusion:** CW is a high-power open-source Python software to analyze cardiac contraction parameters, streamlining drug testing, disease modeling and advancing basic research in the cardiac community.

ID: 5481

*Área: Fisiologia de Órgãos e Sistemas: Renal*

*Forma de Apresentação: Ê-POSTER*

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*Instituições: Universidade Federal da Bahia (UFBA)*

### **HIGH-INTENSITY INTERVAL TRAINING IS MORE EFFECTIVE THAN LOW INTENSITY TRAINING TO REDUCE PRO-INFLAMMATORY CYTOKINES IN FEMALE RATS WITH CISPLATIN NEPHROTOXICITY**

Acute kidney injury (AKI) induced by cisplatin (CP) is associated with increased expression of pro-inflammatory cytokines, including tumor necrosis factor-alpha (TNF- $\alpha$ ), interleukin 1 $\beta$  (IL-1 $\beta$ ) and interleukin 6 (IL-6). The aim of this study was to compare the effects of high-intensity interval training (HIIT) with continuous low intensity training (LIT) aerobic exercise on the renal expression of TNF- $\alpha$ , IL-1 $\beta$  and IL-6 in rats with CP-induced AKI. Therefore, 28 female wistar rats (10 weeks old, weighing 190-220g) were divided into 4 groups (n=7): C+S, sedentary control; CP+S, sedentary cisplatin; CP+LIT, cisplatin and LIT (55% of the maximum capacity); CP+HIIT, cisplatin and HIIT (85% of the maximum capacity). The training consisted in running on treadmill, 5 days/week, for 8 weeks. At the end of the

training, the CP+S, CP+LIT and CP+HIIT groups received a single dose of cisplatin (5 mg/kg, i.p.), and 07 days later they were euthanized. The renal levels of TNF- $\alpha$ , IL-6 and IL-1 $\beta$  were analyzed in duplicate by enzyme-linked immunosorbent assay (ELISA). This study was approved by the Ethics Committee in Animal Experimentation of the UFBA/IMS (protocol 056.2018). Data are presented as mean $\pm$ SD. Statistical differences were defined when  $p < 0.05$ . All groups treated with CP (CP+S: 69.41 $\pm$ 3.5; CP+LIT: 51.59 $\pm$ 2.2; CP+HIIT: 17.90 $\pm$ 2.5) increased the expression of TNF- $\alpha$  compared to C+S (9.48 $\pm$ 1.3) ( $p < 0.001$ ), and although all training protocols reduced this expression ( $p < 0.001$ ), HIIT was more effective than LIT ( $p < 0.001$ ). The levels of IL-6 and IL-1 $\beta$  were greater in CP+S (IL-6: 106.1 $\pm$ 14.0; IL-1 $\beta$ : 127.50 $\pm$ 18.3) and CP+LIT (IL-6: 61.96 $\pm$ 9.9, IL-1 $\beta$ : 69.54 $\pm$ 5.6) than C+S (IL-6: 0.72 $\pm$ 0.8; IL-1 $\beta$ : 11.78 $\pm$ 1.0), whereas CP+HIIT (IL-6: 7.36 $\pm$ 1.7; IL-1 $\beta$ : 17.63 $\pm$ 1.3) was smaller than CP+S and CP+LIT ( $p < 0.001$ ). In conclusion, both training protocols brought renoprotective actions, but HIIT was superior to LIT in reducing expressions of all proinflammatory cytokines investigated in this study.

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Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER

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### ZEB2 CONTRIBUTION TO EPITHELIAL-MESENCHYMAL-TRANSITION IN DIABETIC NEPHROPATHY IN VITAMIN D DEFICIENT RATS

Diabetic nephropathy (DN) is characterized by alterations renal function and structure that can be exacerbated by the reduction of renoprotection provided by vitamin D (VitD). We evaluated the influence of VitD deficiency (VitDD) on the DN in rats with type 1 diabetes mellitus (T1DM). Twenty male Wistar Hannover rats (6-week; 100-120g) were subjected to a previous treatment for 6-weeks with a VitD-free diet (VDFD) or standard diet (SD). The T1DM was induced by a single injection of streptozotocin (45 mg/kg, i.p.) or vehicle injection. The rats were divided into four experimental groups: Ctrl VitD, rats fed with SD, n=5; Ctrl VitDD, rats fed with VDFD, n=5; DM VitD, diabetic rats fed with SD, n=5; DM VitDD, diabetic rats fed with VDFD, n=5. Twenty-four weeks after the induction of T1DM the animals were killed and renal tissue was collected. Ethics Committee: protocol number 002/2019. The rats of DM VitDD demonstrated a significant increase in the glomerular tuft area ( $\mu\text{m}^2$ ), fractional mesangial area, tubulointerstitial fibrosis (%), desmin at the glomerular edge (%), cortical and medullary tubular vimentin (%), and interstitial  $\alpha$ -smooth muscle actin (%) (7148 $\pm$ 391; 0.2 $\pm$ 0.02; 12.4 $\pm$ 5.5; 5.2 $\pm$ 2.3; 0.9 and 2.9; 0.8 and 1.4; 2.6 $\pm$ 1.4; 1.4 $\pm$ 0.9; respectively), when compared to Ctrl VitDD (5648 $\pm$ 219; 0.1 $\pm$ 0.01; 2.6 $\pm$ 1.5; 1.7 $\pm$ 0.7; 0 and 0; 0.2 $\pm$ 0.1; 0.3 $\pm$ 0.1; respectively), and DM VitD (6550 $\pm$ 193; 0.1 $\pm$ 0.03; 6.0 $\pm$ 1.7; 1.8 $\pm$ 0.8; 0.0 and 0.5; 0.0 and 0.4; 0.4 $\pm$ 0.1; 0.4 $\pm$ 0.2; respectively) groups ( $P < 0.05$ ). There was an increase of the number of positive cells in glomeruli and percentage of the cortical and medullary tubular area marked for nuclear transcription factor ZEB2 in the DM VitDD (3.2 $\pm$ 1.5; 2.2 $\pm$ 1.3; 0.0 and 1.6, respectively) compared to Ctrl VitDD (1.9 $\pm$ 1.5; 0.6 $\pm$ 0.2; 0; respectively) and DM VitD (2.9 $\pm$ 2.5; 0.6 $\pm$ 0.3; 0.0 and 1.4; respectively) groups ( $P < 0.05$ ). In conclusion, our data showed that increase ZEB2 activation contributes to developing more intense DN in vitamin D deficient rats.

ID: 5484

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **PPAR $\alpha$ AGONIST DURING LACTATION MAY ATTENUATE THE DEVELOPMENT OF OBESITY INDUCED BY NEONATAL OVERFEEDING**

It has been observed an increase in childhood obesity prevalence, which may persist through adult life. Evidences shows that PPAR $\alpha$  agonist treatment during adult life is able to attenuate the development of obesity. Since lactation is a critical phase of development, we hypothesized that neonatal treatment with a PPAR $\alpha$  agonist prevent the development of obesity during adult life induced by litter reduction. This work was approved by the Animal Ethic Committee (CEUA n<sup>o</sup> 4932250919). Wistar pregnant rats were maintained in standard conditions until delivery. On PN1 litter was standardized for 9 pups per mother, normal litter (NL). At PN3 litter reduction of 3 male pups per mother were performed, small litter (SL). Litters from both groups, were submitted to the treatment with a vehicle (DMSO10% SOLUTOL15%H<sub>2</sub>O – V) or fenofibrate (12.5mg/kg diluted in V – F), during the lactation, PN1 to PN21, forming the experimental groups NL-V (n=6); NL-F(N=5); SL-V (n=6); SL-F (n=6). All animals had free access to standard chow and water. On PN120 euthanasia and sample collection were performed. SL animals were significantly heavier than NL at weaning, PN21 (p<0.0001 2way ANOVA), and that exposure to PPAR $\alpha$  agonist decreased body weight (BW) in NL and SL (p<0.001 2way ANOVA). SL-F offspring had decreased when compared to SL-V (SL-F 51.2 $\pm$ 1.8, SL-V 58.6 $\pm$ 1.3, P<0.05) at weaning. During adult life, SL-V animals have higher BW when compared to NL-V (SL-V 456.6 $\pm$ 9.7, NL-V 418.9  $\pm$ 6.5 p<0.05) and SL-F animals shows no difference when compared do NL-V indicating a trend for reduction in BW. An interaction between SL and F was observed (p<0.01 2way ANOVA), SL-V animals had increased perigonadal fat when compared to NL-V (SL-V 1.3 $\pm$ 0.07, NL-V 0.99 $\pm$ 0.08, p<0.01), which was reduced when compared to SL-F animals (SL-F 1.0 $\pm$ 0.07 vs SL-V, p<0.05). Our data suggest that PPAR $\alpha$  neonatal agonism during early life may attenuate the development of obesity induced by childhood obesity later in life.

ID: 5485

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **EVALUATION OF THE APPLICATION OF ACE AND ACE2 AS LABORATORY MARKERS IN COVID-19 MONITORING**

Angiotensin-Converting Enzymes (ACE and ACE2) are the key regulators of the Renin Angiotensin System (RAS) that play a significant role in acute lung injury, a clinical condition associated with morbidity and mortality from COVID-19 ("Coronavirus Disease 19"), with ECA2 also playing the role of receptor

of the new coronavirus (SARS-CoV-2). This study aimed to evaluate the association of the plasmatic concentration of ACE and ACE2 with the worsening of COVID-19 in order to establish its applicability as laboratory markers for monitoring the disease. Hospital-based prospective cohort study comprising patients with a confirmed diagnosis of COVID-19 treated at field hospitals in Goiânia-GO, approval the Research Ethics Committee (4.180.084) and who were divided into 2 groups: Mild group, composed of individuals who did not require hospitalization, and Death group, composed of individuals who died during hospitalization. The dosage of ACE and ECA2 concentration in the plasma samples obtained was performed by ELISA. Regarding ACE2, a significant reduction (around 30%) was observed in the comparison between the Hypertensive Mild and Death groups ( $p=0.03$ ); between the Mild and Death groups without comorbidities there was no significant difference. In the measurement of ACE, there was no difference between the Mild and Death groups of each category; however, an almost 3-fold increase in enzyme concentration was observed in hypertensive patients ( $p < 0.0001$ ) and in the hypertensive Death group compared to the Mild group without comorbidity (levels 4 times higher,  $p < 0.01$ ). The decrease in ACE2 seems to be a plasmatic marker of COVID-19 worsening in hypertensive patients. It is not ruled out that the ACE concentration may be a plasma marker for the worsening of COVID-19, which needs to be better evaluated considering the weight of hypertension in the elevation of this marker.

ID: 5486

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal de Goiás (UFG)

### EVALUATION OF ACE AND ACE2 POLYMORPHISMS IN THE SUSCEPTIBILITY TO AGGRAVATION OF COVID-19

Polymorphisms of Angiotensin-Converting Enzymes, ACE and ACE2, play a known role in the pathogenesis of Hypertension and cardiovascular complications. COVID-19 is a new pathological condition marked by an unbalance in the renin angiotensin system, whose pathophysiology affects the aforementioned enzymes. In this research, we evaluated the influence of ACE insertion/deletion (I/D) and ACE2 G8790A genetic polymorphisms on the clinical outcome of COVID-19 patients. This work was approved by the Institutional Research Ethics Committee (4.180.084). Blood samples from 1201 patients hospitalized by COVID-19 were collected in field hospitals in Goiânia-Goiás, and 490 samples were genotyped so far, 232 coming from ward patients (moderate group), and 258 from ICU or death (severe group). Sample genotyping was performed by qPCR with Taqman assay. Clinical and sociodemographic data of the patients were collected through the analysis of medical records. Test T,  $\chi^2$  and Logistic Regression with Odds Ratio calculation were applied in the statistical analysis. The results showed that variables such as age ( $p=0.001$ ), presence of cardiovascular diseases ( $p=0.009$ ), lung diseases ( $p=0.02$ ), obesity ( $p=0.019$ ), kidney disease ( $p=0.016$ ) and psychiatric disorders ( $p=0.023$ ) are independent risk factors for worsening. No significant results were found in the preliminary analyzes of the distribution of genotypic frequencies of polymorphisms between the analyzed groups. New analyses, with the inclusion of samples from non-hospitalized patients (mild group), will be performed to complement the results presented.

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Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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### **EFFECTS OF GESTATIONAL VITAMIN D ON SHORT/LONGTERM MEMORY AND CORTICOSTERONE LEVELS AFTER PRENATAL EXPOSURE TO DEXAMETHASONE IN RATS**

Dexamethasone is a synthetic glucocorticoid (GC) often used during pregnancy. However, the overexposure of GC can impair the fetal development, leading to behavioral and cognitive disorders. Vitamin D can be used to attenuate the negative effects of dexamethasone administration. We sought to evaluate the work memory and corticosterone levels of the adult offspring submitted to fetal programming induced by prenatal dexamethasone (PD). We also investigated whether gestational vitamin D (GVD) could reduce the possible cognitive effects of prenatal exposure to dexamethasone. Pregnant Wistar rats were treated with dexamethasone (0.1mg/kg, orally) or vehicle during the final third of pregnancy and received vitamin D orally (500IU/day) or vehicle during the entire pregnancy. Offspring were evaluated at the 3, 6 and 12 postnatal months (PNM) and divided into 4 groups (n=7-10/group): CTL, DEX, VD and DVD. Work memory was assessed during object recognition test (ORT) and corticosterone levels were measured by radioimmunoassay (Ethics Committee on Animal Use UFSC, protocol number 7174170417). In the male offspring, PD led to an improvement of long-term memory at PNM 3, which was blunted by GVD ( $38.6 \pm 6.3$  vs  $47.4 \pm 9$ ;  $42.1 \pm 5.9$  vs  $36.7 \pm 7$ .  $p=0.005$ ). However, at PNM 12, GVD led to an improvement of short-term memory, and the PD blunted this parameter ( $47.7 \pm 11.5$  vs  $63.5 \pm 17.6$ ;  $59.3 \pm 8.3$  vs  $49.3 \pm 14$ .  $p=0.009$ ). The females' performance in the ORT was not affected by PD nor GVD. Corticosterone levels were similar among groups in males and females at PNM 6 and 12. Altogether, these results suggest a time and sex-dependent paradoxical effect of gestational administration of vitamin D and prenatal dexamethasone on the work memory of adult rats. Thus, increasing vitamin D levels during gestation might impact positively on the memory of the male offspring overexposed to GC during gestation.

ID: 5488

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM)

### **EVALUATION OF THE ACTIVITY OF THE ETHANOLIC EXTRACT FROM ROOTS OF *Eriosema campestre* ON IN VITRO AND IN VIVO ACUTE INFLAMMATION CONTEXTS**

*Eriosema Campestre* var. *macrophyllum* (Grear) Fortunato is a medicinal plant known in Minas Gerais as "Pustemeira", and it is used by the folk medicine as an anti-inflammatory agent. However, studies are still necessary to prove its efficacy. So, the aim of this study was to evaluate the effect of the ethanol

extract from the roots of *E. campestre* (ETEC) in acute inflammation contexts. For this purpose, RAW 264.7 cells (murine macrophages) were treated or not with ETEC at 10, 20 or 40 µg/ml (cultures E10, E20 and E40, respectively) or with the solvent dimethylsulfoxide (culture DMSO). Cultures were stimulated with bacterial lipopolysaccharide (100ng/ml) for 24 hours. Positive control culture (LPS) was composed by stimulated cells, but not treated with extract or solvent. After incubation, the concentrations of IL-6, TNF and MCP-1 were measured with ELISA method (n=4). A pilot assay of acute lung inflammation (ALI) induced by intranasal instillation of LPS (10ng) was performed with 7-week-old male C57Bl/6 mice, weighing 20-25g (n = 3). Animals received orally 43, 130 or 430mg/kg of ETEC or the vehicle one hour before LPS instillation. Four hours after LPS administration, bronchoalveolar lavage (BAL) was collected for total leukocytes count. This experiment was previously approved by the UFVJM Animal Ethics Committee (protocol n°: 009/2021). Data were analyzed using one-way ANOVA with Tukey's posthoc. Groups or cultures were considered different when p<0.05. In our results, it was observed that cells from E40 culture produced less IL-6 and MCP-1 than the LPS culture cells (p<0.05). In cultures E10 and E20, lower MCP-1 production was also verified. However, no effect of ETEC on TNF production was observed. In the in vivo pilot assay, a dose-dependent inhibitory effect of ETEC occurred, when evaluating the number of leukocytes in BAL (p<0.05) in the ALI model. Our results suggest anti-inflammatory activity of ETEC, possibly mediated by inhibition of IL-6 and MCP-1.

ID: 5490

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal da Paraíba (UFPB)

### **STRENGTH TRAINING AND LEUCINE SUPPLEMENTATION DIFFERENTLY AFFECT CARDIOVASCULAR PARAMETERS IN A CUSHING'S SYNDROME MODEL ON WISTAR RATS**

Cushing's syndrome is an endocrine disorder caused by hypersecretion of cortisol or prolonged exposure to glucocorticoids. This disorder promotes cardiovascular dysfunctions. This work evaluated the effects of Cushing's syndrome associated or not with leucine administration or strength training on cardiovascular parameters on rats. Experimental procedures were approved by the Ethic Committee on Animal Use of UFPB (4308100520). Male Wistar rats (250-300g) were randomly separated into control (CG); Cushing's syndrome (DG); Cushing+leucine (DLG), and Cushing+training group (DTG). The animals of DG were administered with dexamethasone 1.0mg/kg intraperitoneally, 4x/week/8 weeks. The DLG also received leucine 1% (m/v) daily on drink water in the last four weeks; and the DTG was submitted to a strength training of jumps in water, 3x/week, for the last four weeks. Forty-eight hours after last intervention, the rats were submitted to aortic reactivity experiments to phenylephrine (Phe) and acetylcholine (Ach), and records of mean arterial pressure (MAP). All data were expressed as s.e.m. and were analyzed by ANOVA followed by Tukey's post-test (p<0.05). The aortic sensitivity to Phe was increased in DG (pEC50=7.29±0.03) and DLG (pEC50=7.50±0.04), while in DTG Phe sensitivity was reversed (pEC50=6.74±0.11), compared to CG (pEC50=6.74±0.11). It was observed that there was not difference on Ach sensitivity in DG and DLG (pEC50=7.25±0.18; 7.46±0.21, respectively), compared to CG (pEC50=6.73±0.26); however, in DTG the Ach sensitivity was increased (pEC50=7.77±0.06). Moreover, although there was not difference on MAP between DG, CG and DLG (116.0±0.6; 132.0±4.9 and 128.5±5.2mmHg, respectively), in DTG MAP was reduced (MAP=104.3±3.2). Therefore, strength training improves dexamethasone-induced cardiovascular alterations, despite the worse effects of leucine supplementation.

ID: 5491

Área: Fisiologia Celular

Forma de Apresentação: Ê-POSTER

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Instituições: Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM)

### **IS THERE ASSOCIATION BETWEEN DENGUE VÍRUS SEROPOSITIVITY AND IMMUNOMETABOLIC PARAMETERS IN OBESE INDIVIDUALS?**

Obesity is a metabolic disease characterized by an excess of dysfunctional adipose tissue, nutritional and metabolic imbalance that interferes with immune response activation and may thus leads to infection inadequate response. In this sense, dengue virus (DENV) infection deserves to be highlighted, as it affects millions worldwide and its association with obesity may represent a threat to the population. Thus, we evaluated the relationship between immunometabolic parameters in obesity (OB) and DENV seropositivity. This study was approved by the Research Ethics Committee of the Universidade Federal dos Vales do Jequitinhonha e Mucuri (n° 2143213). The association between OB and its clinical characteristics and the presence of anti-DENV IgM was investigated in a convenience serum sample (n=50), from men and women (18 to 42 years old), without symptoms of acute or chronic diseases, in the convalescent stage of DENV infection. Anthropometric, biochemical, cellular and functional status evaluations of classical, intermediate and non-classical monocyte subpopulations were performed. There was no association between obesity and the presence of anti-DENV IgM (OR: 1.3, 95% CI: 0.6 - 3.0, p = 0.48, n = 49). Anthropometric parameters did not differ between OB anti-DENV IgM+ (n = 15) and anti-DENV IgM- (n = 19). There was no difference in white blood cell count and HLA-DR expression due to the presence or absence of anti-DENV IgM. However, a greater expression of CD11b in total ( $1060.4 \pm 278.4$ , n = 9, vs  $746.1 \pm 295.6$ , n = 11, p = 0.03) and classical monocytes ( $1103.1 \pm 311.3$ , n=9, vs  $720.3 \pm 281.1$ , n = 11, p < 0.01) from OB anti-DENV IgM+ was found. This finding can't be attributed solely to DENV infection as it was not observed between eutrophic anti-DENV IgM+ and IgM- individuals. Thus, the data obtained so far suggest an association between obesity and DENV infection.

ID: 5493

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **EFFECTS OF MFSD2A ON TRANSCYTOSIS OF ENDOTHELIAL CELLS OF THE BLOOD BRAIN BARRIER (BBE) OF TRAINED HYPERTENSIVE (T) AND SEDENTARY (S) RATS**

Hypertension is associated with dysfunction of the blood-brain barrier (BBB) in areas of autonomic control, and training reverses this injury. There is evidence that the transporter protein (Mfsd2a) can regulate transcytosis in the BBB. We evaluated in SHR and S and T normotensive controls the participation of Mfsd2a and in the permeability of the BBB. SHR and Wistar underwent aerobic T (55% maximum capacity, 1h/day, 5 days/week) or S for 4 weeks and femoral catheterization for hemodynamic evaluation. The brains were collected for analysis of the BBB permeability (Rhodamine-70kDa+FITC-10kDa injected

ia) and the paraventricular nucleus of the hypothalamus (PVN) was dissected for analysis of Mfsd2a and Caveolin-1 (qPCR) gene expression. There was performance gain in both T groups, with performance loss in S rats. SHR-S vs Wistar-S showed increases in mean arterial pressure (MAP) and heart rate (HR) (MAP=160±3mmHg; HR=368±9b/min), high permeability of the BBB (SHR-S 4.86±2%area, a 7-fold increase) and Mfsd2a gene expression (1.78±0.05 vs 1.08±0.08AU) and unaltered expression of caveolin-1 in PVN (-0.94±0.10UA). The SHR-T vs SHR-S showed resting bradycardia (341±3b/min) and non-significant drop in MAP, reduced BBB permeability (1.95±2%area), reduced Mfsd2a expression (0.83±0.04UA) and increased expression of Caveolin-1 (7.06±0.27UA). Wistar-T vs Wistar-S did not show significant changes in MAP, HR, BBB permeability and Mfsd2a expression in PVN and only increased caveolin-1 expression. Knowing that Mfsd2a is the main transporter of docosahexaenoic acid, whose intracellular accumulation inhibits the formation of transcytotic vesicles and reduces the permeability of the BBB, our data suggest that the increase in the permeability of the BBB in the SHR-S with the possible reduction of the activity of the Mfsd2a may trigger “upregulation” in its gene expression. These data should be confirmed by the protein expression of Mfsd2a and Caveolin-1.

ID: 5495

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### CARDIOVASCULAR EFFECTS OF CHRONIC CANNABIDIOL (CBD) TREATMENT IN HYPERTENSIVE RENOVASCULAR RATS

Different studies have shown that acute Cannabidiol (CBD) have shown cardiovascular benefits including a decrease in mean blood pressure and oxidative stress in hypertensive rats. However, few studies have analyzed the chronic effects of CBD treatment that cardiopathology. In our study, we propose to evaluate the chronic effects of oral CBD treatment produced by ABRACE ESPERANÇA Institute, in renovascular hypertensive rats (2Kidney-1Clip model). For this, Wistar male rats [(180-200g; 8 weeks) Ceua n.5531250320] were used. Six weeks after 2K1C or Sham surgery, the animals underwent a chronic treatment with CBD (20mg/kg) by gavage (2x per day during 14 days), according to the following groups: Sham/vehicle (n=6); Sham/CBD (n=3); 2K1C/vehicle (n=6); 2K1C/CBD(n=8). After animals had femoral artery and vein catheterized and, in the next day, the arterial cannula was connected to a pressure transducer to baseline cardiovascular recordings as well as in response to phenylephrine (8 µg/kg iv), sodium nitroprusside (25 µg/kg iv) or hexamethonium (30 µg/kg iv)]. Statistical analysis: One-Way ANOVA, t-test, Newman Kewls, p<0.05. Results showed that CBD treatment did not change mean arterial pressure (MAP) in Sham/CBD (109.9 ± 4.9 vs. 124.1 ± 8 mmHg; P <0.05) but decreased MAP in 2K1C/CBD (138.7 ± 9.6 vs. 174.8 ± 11.31 mmHg; P=0.03). In 2K1C/CBD (381.8 ±15.4 vs. 316.8 ± 15.4bpm; P<0.05) we observed an increased in baseline HR Furthermore, CBD treatment induced an increase in the baroreflex sensitivity in 2K1C (-1.8 ± 0.06 vs. -2.1 ± 0.1bpm.mmHg-1; P=0.01) (n=8) and decreased and CBD treatment trended to decrease hexamethonium (30 µg/k iv) induces hypotensive response in 2K1C Δ50.0 ± 3.4 vs. - Δ61.0 ± 7.5; P=0.2) (n=05). Our results suggest that chronic CBD (20mg/kg) treatment decreases blood pressure, increased baroreflex gain, and seems to decrease vasosympathetic influence in renovascular hypertension.

ID: 5496

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **KETAMINE AS A LIMITING FACTOR IN THE CHARACTERIZATION OF EXPERIMENTAL SEPSIS MODEL TO STUDY DEPRESSIVE DISORDERS**

Depression is a multifactorial disorder and the ineffectiveness of antidepressants is closely linked to inadequate understandings of its pathophysiology. Recent studies demonstrate that inflammation has a strong correlation with depression, due to the presence of circulating pro-inflammatory cytokines and its evoked behavioral changes in diagnosed patients. In this sense, the aim of this study was to characterize a new animal model to study depressive disorders caused by chronic inflammation through an experimental sepsis model (CLP). However, the new model was faced with a limitation: the high antidepressant potential at low doses of Ketamine used as anesthetic in the surgery. So, we compared the model groups using different anesthetics, the mixture of ketamine + xylazine and tribromoethanol (TBE). The behavioral changes were evaluated in male Wistar rats that underwent Cecal Ligation and Perforation surgery 7, 14 and 21 days after surgery, in four different groups 1) SHAM Ketamine + Xylazine 2) CLP Ketamine + Xylazine 3) SHAM TBE e 4) CLP TBE. It was found profound differences in animals anesthetized with TBE, 7 and 14 days after surgery, in the Forced Swim test (FST), in which SHAM animals swam more than CLP ( $61.61 \pm 11.66$  vs.  $16.23 \pm 5.025$ ;  $p=0.0038$ ), ( $82.50 \pm 14.81$  vs.  $35.93 \pm 15.23$ ;  $p=0.0488$ ), and floated less ( $216.5 \pm 15.53$  vs.  $275.4 \pm 7.176$ ;  $p=0.0048$ ), ( $183.7 \pm 21.59$  vs.  $258.8 \pm 15.30$ ;  $p=0.0149$ ). From the Open Field test (OFT), it was demonstrated that the surgery did not affect the locomotion of any animals ( $p>0.05$ ). Animals anesthetized with Ketamine and Xylazine, did not present changes in the FST or OFT. In conclusion, Ketamine has shown limiting properties to the execution of experimental sepsis CLP model to study depression, going in favor of the current scientific literature that stands it out as a potentially antidepressant substance, even in a single small dose. Thus, this study presents satisfactory results, contributing to the advances of Experimental Psychiatry.

ID: 5497

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### **VENTILATORY RESPONSES TO HYPERCAPNIA AND HYPOXIA DURING POSTNATAL PERIOD OF RATS SUSCEPTIBLE TO EPILEPSY**

Epilepsy is a neurological disease characterized by recurrent epileptic seizures. In addition, seizure events compromise the autonomous cardiorespiratory activity. Studies show that adult male rats susceptible to epilepsy (Wistar Audiogenic Rats, WAR strain) have a reduced ventilatory response to hypercapnia (7% CO<sub>2</sub>) with a serotonergic dysfunction in the medullary raphe when compared

to Wistar rats. The medullary raphe is a region that contains chemosensitive serotonergic neurons in adult animals. In newborn rats (P1), these neurons do not present well-defined chemosensitivity characteristics, but they are important for the development of the respiratory pattern, once the ablation of these neurons promotes severe apneas in neonates. Thus, our hypothesis is that WAR animals present changes in their breathing pattern in the first days of life due to a serotonin deficit. For this purpose, we used newborn male and female rats (P1-P3) WAR and Wistar (CEUA 78/2021). We assess mastication reflex by stimulating oral movements with a polyethylene tube during 20s and evaluated ventilation (VE) by pressure plethysmography under room air, hypercapnia (7% CO<sub>2</sub>) or hypoxic conditions (10%O<sub>2</sub>). Our results show that mastication reflex is impaired in WAR (WAR:  $7.71 \pm 5.12$ ; n=28 vs WISTAR:  $21.64 \pm 4.22$  mast/20s; n=36; p<0.05). In room air, VE of WAR animals is statistically similar to Wistar, however WAR group has long-lasting apneas when compared to control group (WAR:  $5.60 \pm 1.17$ s; n=5 vs WISTAR:  $1.61 \pm 0.57$ s, n=10). The ventilatory response to hypercapnia was not different between groups (P>0.05), but the ventilatory response to hypoxia was found attenuated (WAR:  $2012.43 \pm 89.73$ ; n=13 vs WISTAR:  $1343.07 \pm 179.28$  ml/min/kg, n=6; p<0.05). In conclusion, these preliminary results show that WAR neonatal rats present changes in breathing pattern and a decreased hypoxic VE response. Further experiments are necessary to address the question if serotonergic dysfunction is present.

ID: 5498

Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **IMPACT OF OCCLUSIVE ARTERIAL CATHETERIZATION IN HEART RATE AND ARTERIAL PRESSURE VARIABILITY INDICES AND BAROREFLEX FUNCTION IN AWAKE RATS**

Occlusive arterial catheterization is a standard procedure for measuring blood pressure (BP) in awake animals. However, it is reasonable to assume that it can negatively affect the animals, potentially hampering the interpretation of collected data. Wistar rats received occlusive catheters into the femoral artery (N=10) or carotid artery (N=9) while a distinct group of (N=13) were instrumented with catheters into the abdominal aorta by a non-occluding approach. After 48h, or 5 days (aorta group), the animals had their BP directly recorded for 30 min. Series of systolic BP and pulse interval (PI) were generated, and indices of PI and BP variability in time and frequency domain as well as by non-linear approaches were calculated. Baroreflex function was also evaluated by the sequence method. Ethics nº (016 and 023/2013.1). Rats with a catheter into the carotid were tachycardic (PI= $151 \pm 5$  ms) as compared to other groups (PI= $180 \pm 5$  and  $170 \pm 6$  ms). HRV indices calculated in time and frequency domain, as well as Symbolic Analysis and Sample Entropy, were similar among groups. Systolic BP was higher ( $126 \pm 3$  mmHg) in rats with a catheter into the femoral artery than counterparts with a non-occlusive catheter into the aorta ( $113 \pm 3$  mmHg). Similarly, low-frequency power of BP spectra and percentage of occurrence of 1V (both indices linked to sympathetic activity) were higher in rats with a catheter into the femoral artery ( $6.9 \pm 1.1$  mmHg<sup>2</sup> and  $45 \pm 2$  %) than animals with a non-occlusive catheter into the aorta ( $3.2$  mmHg<sup>2</sup> and  $36 \pm 2$  %). The standard deviation of systolic BP values did not differ among groups. Finally, animals instrumented with femoral catheters exhibited lower baroreflex sensitivity ( $0.9 \pm 0.06$  ms/mmHg) than counterparts with non-occlusive catheters into the abdominal aorta ( $1.3 \pm 0.06$  ms/mmHg). Our study showed that occlusive catheterization (femoral or carotid) affects cardiovascular modulation indices with potential repercussions on studies of cardiovascular function.

ID: 5501

Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

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### **ACUTE COLD EXPOSURE CAUSES AN ERGOLYTIC EFFECT DURING TREADMILL EXERCISE TEST IN MICE**

Introduction: Cold exposure causes several physiological responses, such as thermogenesis that elevates metabolic heat production to maintain body temperature. However, the effects of cold on aerobic performance and exercise metabolism are still unclear. Objective: To evaluate the aerobic physical performance in mice exposed acutely to cold environment. Methods: SWISS adult male mice were exposed for 12 hours to cold (~4°C; COLD) at night (active phase – 7pm to 7am) or to a thermoneutral environment (TE; ~28°C; control/CON). The physical performance in incremental treadmill test was performed: 1) immediately after cold exposure (morning) and 2) ~8 hours after cold exposure while mice were kept at rest in TE (afternoon). Time to fatigue (TTF), maximum speed (Smax) and post-test blood glucose were evaluated. All experiments and protocols were approved by Universidade Federal de Minas Gerais (UFMG) - The Ethics Committee on Animal Use (CEUA 84/2020). Results: The morning test revealed that TTF was reduced (14%; P=0.019) by COLD. The afternoon test also showed a reduction in TTF (23%, P=0.041) and Smax (18%, P=0.046) by COLD. There was no change in post-test blood glucose in COLD in the morning (P=0.1) and afternoon (P=0.99) tests. Conclusion: The ergolytic effect of acute cold exposure is observed immediately after 12 hours in this condition and remains for more 8 hours, even if the animals are transferred back to TE in order to rest.

ID: 5502

Área: *Fisiologia de Órgãos e Sistemas: Cardiovascular*

Forma de Apresentação: *Ê-POSTER*

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### **ARE ASTROCYTES IN THE NTS INVOLVED IN THE MODULATION OF THE CARDIORESPIRATORY CHEMOREFLEX RESPONSES IN RATS SUBMITTED TO SUSTAINED HYPOXIA?**

Astrocytes interact with neurons and modulate synaptic transmission. Sustained hypoxia (SH) for 24h in Wistar-RP rats increase arterial pressure, ventilation and chemoreflex sensitivity, which may be due to SH-related astrocytic dysfunction in the NTS. Here, we investigate whether astrocytic inhibition in the commissural NTS affects autonomic and respiratory responses to chemoreflex activation in Sprague Dawley (SD) rats submitted to SH. For this, we used in situ preparations of male SD rats submitted to SH (FiO<sub>2</sub>:0.1) or normoxia (CTL) during 24 hours to evaluate the heart rate (HR) and the activities of thoracic sympathetic (tSN), abdominal (AbdN) and phrenic (PN) nerves at baseline conditions and in response to chemoreflex activation (KCN) before and after bilateral microinjections of fluorocitrate (FCT, 50 mM, 25 nL), a specific astrocytic inhibitor, or saline (SAL) in the NTS (CEUA #51/2018). No changes

were observed in HR and in the baseline activities of tSN, AbdN, and PN after the microinjections of FCt in the NTS of control (n=7) and SH (n=9) rats. Similarly, changes in the magnitudes of tSN, AbdN and PN activities to chemoreflex activation were not affected by FCt. However, a significant reduction ( $P<0.05$ ) was observed in the magnitude of the bradycardic response to chemoreflex activation at 45 (CTL:  $-219 \pm 35$  vs.  $-208 \pm 107$  vs. SH:  $-192 \pm 81$  vs.  $-98 \pm 68$  bpm) and 60 minutes (CTL:  $-223 \pm 45$  vs.  $-200 \pm 98$  vs. SH:  $-186 \pm 87$  vs.  $-98 \pm 85$  bpm) after microinjections of FCt in the NTS of SH rats. These data are showing that the effect of astrocytic inhibition in the NTS is restricted to the heart parasympathetic component of the chemoreflex and suggest that the sympathetic and respiratory components of this reflex are not affected by changes in astrocytic modulation after SH.

ID: 5503

Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **MACRONUTRIENT INTAKE, BUT NOT BODY COMPOSITION AND MUSCLE STRENGTH, IS ALTERED IN A 50-DAY ANTARCTIC EXPEDITION**

Introduction: Cold exposure can impair muscle strength due to a decrease in central and peripheral body temperatures. Cold can also alter appetite and consequently body composition in extreme environments such as Antarctica. Objective: To investigate the quantity and quality of food consumption, body composition and muscle strength of expeditioners in Antarctica in a 50-day expedition (~7 weeks; 7w). Methods: For analysis of food consumption, 2 food intake records (FIR) were completed by each volunteer (4 men and 1 woman): one FIR at week 3 of expedition (3w) and the other at the end of 7w. Body mass was measured and the percentage of fat and fat-free mass was estimated by 7 skinfolds (triceps, chest, midaxillary, subscapular, abdominal, suprailiac and thigh). For analysis of maximum isometric strength, 3 trials of handgrip test were performed with a dynamometer and the highest value was considered. For statistical analysis, paired t test was used to compare the time-points (3w vs. 7w). All experiments and protocols were approved by Universidade Federal de Minas Gerais (UFMG) - The Ethics Committee on Research (CEP 4.294.245). Results: The 7w FIR revealed that expeditioners significantly increased (21%,  $P=0.002$ ) carbohydrate intake compared to 3w FIR. However, protein, lipid and total energy intake did not change during this period. For this reason, body composition was unaffected during expedition. Maximum isometric strength did not alter from 3w to 7w. Conclusion: Despite changes in the eating pattern of Antarctica expeditioners over the time, by increasing carbohydrate intake, body composition and upper limb muscle strength were unchanged.

ID: 5504

Área: Fisiologia de Órgãos e Sistemas: Renal

Forma de Apresentação: Ê-POSTER - Prêmio Álvaro

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### **PROTECTIVE EFFECT OF HIGH-INTENSITY INTERVAL TRAINING AND LOW INTENSITY TRAINING AGAINST CISPLATIN NEPHROTOXICITY VIA THE TLR4/NF-KB SIGNALING PATHWAY**

TLR4/NF- $\kappa$ B pathway is involved in cisplatin (CP)-induced acute kidney injury (AKI). This study aims to compare the renoprotection of high-intensity interval training (HIIT) with low intensity training (LIT) via modulation of the TLR4/NF- $\kappa$ B pathway in rats with CP-induced AKI. Therefore, 28 female wistar rats (10 weeks old, 190–220 g) were distributed into groups (n=7): C+S, sedentary control; CP+S, CP and sedentary; CP+LIT, CP and LIT (50% of the maximum capacity [MC]); CP+HIIT, CP and HIIT (85% of the MC). Training consisted of running on treadmill, 5 days/week, for 8 weeks. Then, 48 h after the protocols' end, CP+S, CP+LIT and CP+HIIT received a single dose of CP (5mg/kg, i.p.) and, 7 days later, animals were euthanized. Kidney tissue underwent histopathological analysis through light microscopy. TLR4, NF- $\kappa$ B and MCP-1 expression were analyzed in renal tissue by quantitative real-time polymerase chain reaction. The experimental protocol was approved by the Ethics Committee in Animal Experimentation of the UFBA/IMS (protocol 056/2018). Data are presented as mean $\pm$ SD. Statistical differences were defined when  $p < 0.05$ . Results show that CP+S (2.8 $\pm$ 0.9) and CP+LIT (2.7 $\pm$ 0.6) presented higher tubulointerstitial damage compared to C+S (0.1 $\pm$ 0.2) ( $p < 0.001$ ), but only CP+HIIT (0.8 $\pm$ 0.7) mitigated such injuries ( $p < 0.001$ ). Both CP+S (5.0 $\pm$ 0.9) and CP+LIT (3.1 $\pm$ 0.3) showed increased TLR4 expression compared to C+S (1.0 $\pm$ 0.2) ( $p < 0.001$ ), and HIIT (1.4 $\pm$ 0.1) reduced more than LIT ( $p < 0.001$ ). All CP treated groups, principally CP+S (NF- $\kappa$ B: 8.8 $\pm$ 0.7; MCP-1: 29.5 $\pm$ 3.2), demonstrated higher NF- $\kappa$ B and MCP-1 expression than C+S (NF- $\kappa$ B: 1.0 $\pm$ 0.2; MCP-1: 1.0 $\pm$ 0.7) ( $p < 0.001$ ), but HIIT (NF- $\kappa$ B: 3.8 $\pm$ 0.4; MCP-1: 8.9 $\pm$ 1.0) was more effective than LIT (NF- $\kappa$ B: 6.7 $\pm$ 0.5; MCP-1: 21.3 $\pm$ 2.8) in reducing it ( $p < 0.001$ ). In conclusion, although both training protocols brought renoprotective effects, greater benefits were obtained with HIIT, suggesting more effectiveness of such training modality over CP-induced AKI.

*ID: 5505*

*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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### **HEART RATE AND BLOOD PRESSURE VARIABILITY IN RATS ANESTHETIZED WITH KETAMINE/XYLAZINE, URETHANE OR ISOFLURANE**

Anesthesia elicits changes in cardiovascular parameters, which may markedly affect data collected in anesthetized animals compared with conscious ones. A valuable noninvasive approach for assessing cardiovascular regulation is the analysis of the variability of cardiovascular signals such as heart rate (HR) and blood pressure (BP). We evaluated the changes in BP and HR variability elicited by anesthesia with ketamine+xylozine (KX), urethane (URE), or isoflurane (ISO) in rats. Young adult male Wistar rats (270-320g) were instrumented with catheters into the femoral artery and, after 48h, had their BP recorded at conscious state for 30 min. Following, the animals were anesthetized with KX (n=7), URE (n=7), or ISO (n=10), and BP recording continued for 30 min. in anesthetized state (protocol:132/2017). KX increased BP (118 $\pm$ 4 to 144 $\pm$ 4 mmHg) and Pulse Interval (PI: 156 $\pm$ 3 to 187 $\pm$ 3 ms). URE did not affect BP but lowered PI (156 $\pm$ 4 to 128 $\pm$ 4 ms). ISO lowered BP (123 $\pm$ 2 to 106 $\pm$ 2 mmHg) while did not change PI. All anesthetic agents markedly reduced overall HR variability evaluated in the time domain.

The power of PI spectra was markedly lowered at high-frequency band (respiratory sinus arrhythmia) by all anesthetic agents. Nevertheless, at low-frequency band, power of PI spectra was reduced only by KX and URE. Multiscale entropy of PI was markedly lowered by all anesthetic agents at scales 7-20, but only by KX and URE at scales 1-6. All anesthetic agents lowered the detrended fluctuation analysis at short (5-15) and increased at long-scales (100-1000). Heart rate fragmentation (% of inflection points) was not affected by KX and URE but was reduced by ISO. The standard deviation of BP was lowered only by KX and URE. Spectral analysis of systolic BP values showed a similar pattern of PI spectra. We strengthen the importance of the anesthetic influence on cardiovascular function and we believe that ISO is the less interfering agent, while KX is the most depressing one.

ID: 5507

Área: *Fisiologia do Exercício*

Forma de Apresentação: *Ê-POSTER*

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## **RESPONSES OF CARDIORESPIRATORY VARIABLES IN CROSSOVER INTERVENTIONS OF LAND RUNNING AND DEEP-WATER RUNNING**

Cardiorespiratory fitness (CRF) is a very important component of physical fitness for exercise prescription and has been extensively studied due to its ability to assess the aerobic response caused by physiological changes induced by physical exercise. The land running (LR), as it is an aerobic exercise, promotes improvements in ACR, however, given the high impact with the ground, musculoskeletal injuries are common. Therefore, deep water running (DWR) can be an alternative to improve the CRF without great risk of being affected by the above-mentioned injuries. Therefore, the aim of this study was to verify the cardiorespiratory responses in adults undergoing LR and DWR crossover interventions. A systematic review was carried out, using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method, developed after registration in the international database PROSPERO. The descriptor "running" was used, chosen from the Medical Subject Headings (MeSH), and keywords found in studies related to the topic. The articles were chosen from the steps: eligibility criteria, evaluation of the quality of studies and qualitative and quantitative synthesis. A priori, 406 articles were identified and, after analyzing the inclusion criteria, seven were selected. Resulting in 112 subjects aged 15 to 65 years and maximum CAT and CAP tests with intervals of one to seven days, intensity controlled by heart rate (HR) and/or stride frequency, and duration until exhaustion. Cardiorespiratory variables were observed. The terrestrial environment seems to allow maintaining higher intensities when compared to running amplitudes in the aquatic environment and this seems to be able to significantly affect the cardiorespiratory system. The studies show that CAP produces lower cardiorespiratory responses when compared to CAT, however, the low number of articles collected involving this theme demonstrates the great deficit of information, requiring more original research.

ID: 5509

Área: *Fisiologia de Órgãos e Sistemas: Respiratória*

Forma de Apresentação: *Ê-POSTER*

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## **EXTRACELLULAR VESICLES RELEASED FROM DIFFERENT MESENCHYMAL STROMAL CELL SOURCES PRESENT DISTINCT EFFECTS ON LUNG, KIDNEY AND LIVER IN EXPERIMENTAL SEPSIS**

Mesenchymal stromal cells (MSCs)' extracellular vesicles (EVs) seem to have immunological properties as MSCs. To evaluate the effects of different sources of MSCs-derived EVs on mortality rate, lung, kidney, and liver damage in experimental sepsis. Additionally, comparative proteomic content of EVs was evaluated. Sepsis was induced by cecal ligation and puncture surgery (SEPSIS). A sham-operated group was used as control. After 6 and 24 hours, all animals received antibiotic therapy. After 24 hours, SEPSIS animals received saline or EVs from  $3 \times 10^6$  BM-, AD-, or L-derived MSCs. Forty-eight hours after sepsis induction, lung, liver and kidney histology, as well as protein and mRNA expression of different mediators were evaluated. Survival rate was assessed every 24 hours. EVs derived from different MSC sources were characterized according to intensity and hydrodynamic diameter as well as the proteomic content of the EV fraction. In SEPSIS group, EVs from all sources reduced tumor necrosis factor (TNF)- $\alpha$  in lung tissue, neutrophils in alveolar septa and diffuse alveolar damage compared to SAL. BM-EVs reduced liver congestion and cells in sinusoids. EVs from all sources decreased kidney interstitial edema, but only BM-EVs preserved brush border. Furthermore, BM- and L-, but not AD-derived EVs, reduced interleukin (IL)-18 and KIM-1 mRNA levels. Despite not being significant, AD-EVs were associated to reduced survival rate compared to BM-EVs and L-EVs. BM-, AD-, and L-EVs exhibited similar hydrodynamic diameters but differed according to their proteomic content. BM-EVs expressed more anti-inflammatory proteins. AD-EVs expressed less fibronectin, which may be associated with reduced beneficial effects in this sepsis model. In the current model of sepsis, BM-EVs were associated with less lung, liver and kidney damage compared to AD-EVs and L-EVs, which can be related to differences detected in their proteomic content.

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*Área: Ensino e Divulgação Científica*

*Forma de Apresentação: Ê-POSTER*

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## **FACIOLOGIA PROJECT - UNCOMPLICATING HUMAN PHYSIOLOGY**

In the globalized world, digital tools are essential in scientific dissemination, as platforms for easy access to the information produced. Above all, the contents of the Human Physiology discipline, although dense, are essential for the training of health professionals. Given the need to make this knowledge more accessible, the "Faciologia Project – Uncomplicating Human Physiology" emerged, created in October 2019 with the objective of facilitating the teaching-learning process through active methodologies and dissemination of teaching material. To house the project, Instagram was chosen, due to its reach and popularity. Several posts were made according to the available resource, such as

reels, IGTV, stories and informative post in the feed. To check the degree of engagement, the metrics provided by the platform were used, such as reach, impressions and shares, with the reach being used to compare the engagement between the types of posts. Therefore, between June 11 and August 9, 2021, 52 publications were produced: 26 stories, 18 informative posts, 4 reels and 1 IGTV. Reels was the most engaging feature, with 150 likes, the most popular. While the post with the greatest engagement was also a reel on the role of hormones during exercise. In the period analyzed, the profile had a considerable growth of 40 followers, which can be justified by the use of reels, since the platform's algorithm favors those who make constant use of the new tools. In contrast, the insights indicate little public interest in scientific posts published in the feed; which is a challenge to be faced by the project. However, it is concluded that Faciologia has been of great educational and social importance, as it facilitates the understanding of scientific content, promoting improvements in teaching-learning of its audience.

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*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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#### **NEURAL SUBSTRATES INVOLVED IN THE SOCIAL INTERACTION MODULATION OF THE LIGHT-INDUCED ACTIVATION OF THE CENTRAL CIRCADIAN CLOCK**

The suprachiasmatic nucleus of the hypothalamus (SCN) is the central circadian clock responsible for the synchronization of circadian rhythms to the light-dark (LD) cycle. Although, light is the primary time cue (Zeitgeber, ZT), a full activation of SCN in the beginning of the light phase requires social interaction. However, the neural substrates recruited by social interaction in the modulation of SCN neuronal activity are not known. To evaluate this, we compared the neuronal activity of the paraventricular nucleus of the hypothalamus (PVN) and of noradrenergic neurons of the locus coeruleus (LC), as well as serotonergic and dopaminergic turnover in the SCN between adult male C57BL6/J singlehoused (SH) and group-housed (GH, 3-4 per cage) mice under 12:12h LD cycle. After 28 days, at ZT2 (2h after lights on) or ZT14 (2h after lights off), analysis of c-Fos immunoreactivity (ir) in the PVN, as well as tyrosinehydroxylase (TH, a marker of catecholaminergic neuron) and c-Fos-ir in the LC, as well as of serotonin (5-HT), dopamine (DA) and their metabolites (5-HIAA and DOPAC, respectively) through HPLC and electrochemical detection in the SCN were done in mice brains (CEUA/UFMG nº 11/2018). Compared with GH mice, SH mice showed a reduction in the number of c-Fos-ir neurons in the PVN at ZT2. This was accompanied by a reduction in the number of TH-ir neurons co-localized with c-Fos in the LC, but by an increase in 5-HIAA/5-HT ratio as well as of DOPAC/DA ratio in the SCN. No differences were observed between ZTs within groups or between GH and SH mice at ZT14 in all analysis. Thus, social interaction increased 5-HT and DA SCN turnover in the beginning of the light phase, while it decreased PVN neuronal activity as well as noradrenergic neuronal activity in the LC. In conclusion, serotonergic, dopaminergic, and noradrenergic systems may contribute to the full activation of the SCN required to the light-synchronization in the presence of the social stimulus.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **WATER DEPRIVATION-INDUCED WATER AND SODIUM INTAKE IN HIGH FAT DIET OVARECTOMIZED RATS WITH 17 $\beta$ -ESTRADIOL REPLACEMENT**

Water deprivation (WD) is a common situation in nature and induces water and sodium intake induced by angiotensin II (ANG II). These effects are reduced in ovariectomized (OVX) rats treated with 17 $\beta$ -Estradiol (E2). Since obesity increases ANG II levels, we aimed to verify the WD-induced water and 0.3 M NaCl intake in standard diet (SD, 11% calories from fat) and HFD (45% calories from fat) female OVX rats with or without E2 replacement. Female Holtzman rats (260 –300g) at week 0 underwent OVX and part of the SD and HFD fed rats received in the 4th week a mini-pump with E2 (10 $\mu$ g/day/rat) for the next 4 weeks, resulting in 4 groups: SD-OVX (n=11), SD-OVX+E2 (n=7), HFD-OVX (n=11), HFD-OVX+E2 (n=6). We used WD-partial rehydration (PR) protocol to induce thirst and sodium appetite. Briefly, rats were maintained during 24 h with access to only food pellets. After this, WD rats were allowed to drink only water for 2 h until satiety (PR) and then animals had access to a 0.3 M NaCl for a salt appetite test (2 h). Three-way ANOVA (diet x treatment x time) was performed. All results are expressed as ml/100 g of b.wt./2 h. There was a reduction in WD-induced water intake in SD-OVX+E2 compared to SD-OVX (3.8  $\pm$  0.3 vs. SD-OVX: 4.2  $\pm$  0.3 ml/2 h; p < 0.05), but not in HFD-OVX+E2 group compared to HFD-OVX. E2 replacement produced an anti-natriorexigenic response in SD-OVX+E2 group (1.1  $\pm$  0.3 vs. SD-OVX: 1.9  $\pm$  0.2 ml/2 h; p < 0.05) and a natriorexigenic response in HFD-OVX+E2 rats (2.0  $\pm$  0.5 vs. HFD-OVX: 1.2  $\pm$  0.2 ml/2 h; p < 0.05). The increase in visceral adipose tissues in HFD-OVX was reversed in HFD-OVX+E2 group and uterus weight was greater in OVX SD and HFD groups after E2 treatment. The results show that in WD HFD-OVX+E2 rats, E2 did not induce anti-dipsogenic effect and there was, an unexpected natriorexigenic effect.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **NBOME: THE PSYCHEDELIC MODULATION OF THE DEPRESSIVE-LIKE BEHAVIOR INDUCED BY SEPSIS-ASSOCIATED ENCEPHALOPATHY IN RODENTS**

Depressive disorders affect one in ten people worldwide and the numerous modalities of antidepressants available are not effective in more than 60% of cases. We are currently experiencing a renaissance in

Psychedelics research, yet preclinical studies are falling behind. In this regard, the aim of this study was to shed light on a new potentially antidepressant psychedelic substance, NBOMe, and to study its effects in a rat model. Firstly, surgical interventions of Cecal Ligation and Perforation (CLP) were performed to induce depressive-like behavior, in consequence of sepsis-associated encephalopathy. Then, they were assessed 7, 14 and 21 days after surgery in behavioral tests that predict depressive-like behavior, such as the forced swim (FST) and the open field (OFT). CLP Animals (n=8) have shown statistically floating behavior 7 and 14 days after surgery in FST ( $p < 0.05$ ), while SHAM animals (n=8) have not ( $p > 0.05$ ). Then, naive animals treated with NBOMe (0.3; 1 and 3 mg/Kg) were assessed in the same behavioral tests (n=8), as well as in head twitch response (HTR). The higher dose showed antidepressant-like effect ( $p < 0.05$ ). SHAM (n=8) and CLP (n=8) animals were treated with NBOMe 3 mg/Kg (n=8) and vehicle 1 mg/Kg (n=8) 14 days after surgery and tested right after administration during 20 minutes in HTR, then 5 minutes in OFT and 5 minutes in FST. It was demonstrated that CLP animals treated with NBOMe get more motivated than vehicle CLP animals in the FST ( $p < 0.05$ ). The OFT showed that the animals were not hyperstimulated by the drug, once their locomotor activity had decreased ( $p < 0.05$ ), and the HTR revealed hallucinogenic properties ( $p < 0.05$ ), as expected. These results have shown promising outcomes, elucidating for the first time the potential antidepressant properties of NBOMe in regard to behavioral changes and contributing to the advancements of Experimental Psychiatry toward safe and effective clinical practice in the Psychedelics Research field.

ID: 5519

Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **CARDIOVASCULAR EFFECTS OF TREATMENT WITH MORUS NIGRA EXTRACT IN OVARECTOMIZED RATS**

Hypoestrogenism is characterized by decreased ovarian estrogens production, particularly 17- $\beta$ -estradiol. Menopause constitutes, therefore, one type of hypoestrogenism condition. Morus nigra tea (produced from leaves) is popularly used as a hormonal replenisher, in order to presumably decrease climacteric symptoms. Therefore, the present study evaluated the efficacy of treatment with Morus nigra leaves extract on systolic pressure (SP), diastolic pressure (DP), heart rate (HR) and mean arterial pressure (MAP) in rats previously submitted to bilateral ovariectomy (OVX). Also, the relative masses of adrenal gland, uterus and neurohypophysis were estimated. In order to achieve these goals, 8-week female Wistar rats submitted to OVX or sham surgery (SHAM) were daily treated during 6 weeks with: 1) Morus nigra extract (100, 200 and 300 mg/Kg/mL), 2) diluent (saline solution 0.9%, negative control = NC) or 3) estradiol cypionate (0.025  $\mu$ g/Kg/mL, positive control = PC). The experimental protocol was approved by CEUA Unifal-MG (02/2019). Uterus of OVX PC rats showed normal mass, whereas treatment with the extract was not able to reverse the OVX-induced uterus hypotrophy. Adrenal mass showed a significant increase in OVX PC, E-100 and E-200 groups, when compared to OVX NC group. Neurohypophysis mass was significantly decreased in SHAM PC animals and also in SHAM E-100 and E-200 groups. Regarding cardiovascular data, an increase on SP was found in SHAM E-100 group, when compared to SHAM CN group. The data using gas chromatography coupled with mass spectrometry showed the possible presence of isoflavones in the extract. Therefore, we conclude that these molecules are likely to bind to estrogen receptors, mimicking estrogen effects. Despite that, the initial hypothesis that Morus nigra extract treatment could function as a hormonal replenisher, with potential estrogen-like effects on

the cardiovascular system, was not confirmed by the present results.

ID: 5522

*Área: Fisiologia do Exercício*

*Forma de Apresentação: Ê-POSTER*

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### **EFFECT OF NICOTINAMIDE ON DOXORUBICIN-INDUCED CARDIOTOXICITY**

A limiting factor in antitumor treatment is the cardiotoxicity caused by anticancer drugs, making the development of cardioprotective strategies important in this context. Nicotinamide (N), a proactive form of vitamin B3, presents itself as a possible cardioprotector by inhibiting PARP-1, a protein with an important role in the induction of cardiotoxicity by Doxorubicin (D). The aim was evaluating the effect of N on D-induced cardiotoxicity in vivo. For this, 21 male C57BL/6 mice (11 weeks-old,  $25.5 \pm 1.2$ g) were divided into 3 groups: Control (C), D, N+D. The D group received a cumulative dose of 15mg/kg (3 applications for 5 days). The N+D group received N (0.9mg/kg) via gavage 15 minutes before D injection. The C group received saline in the same regimen as the other groups. Cardiac function was assessed by echocardiography 24h after the last application. The study was approved by FMUSP Ethics Committee (protocol number 1411/2020). The D group reported a mortality of 14.3% and around 17% of the animals in this group did not show signs of cardiotoxicity. The D( $2.8 \pm 1.1$ g) and N+D( $2.6 \pm 0.72$ g) groups demonstrated a reduction in weight compared to C( $0.33 \pm 0.44$ g). The D group showed a decrease in ejection ( $38.8 \pm 1.1\%$ ) and shortening fractions ( $18.7 \pm 2.3\%$ ), respectively compared to C and N+D. This indicates a systolic dysfunction caused by D. Also, a reduction and deceleration in the E wave of approximately 27.6% was observed in the D and N+D groups in relation to C, indicating a diastolic dysfunction. N was not able to prevent liver congestion caused by the treatment or the reduction in ventricular mass corrected by tibia induced by D. In conclusion, D was effective in inducing moderate acute systolic dysfunction and mild diastolic dysfunction in 83% of the animals. N administration did not change diastolic dysfunction, but it reversed mortality and systolic dysfunction, reinforcing the therapeutic potential of PARP-1 inhibition in D-induced cardiotoxicity.

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*Área: Fisiologia do Exercício*

*Forma de Apresentação: Ê-POSTER*

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### **THE ROLE OF H1 AND H2 HISTAMINERGIC RECEPTORS ON VASODILATION DURING AND POSTEXERCISE**

Introduction: The histaminergic pathway contributes with vasodilation during exercise and exercise recovery (1-3), but the role of H1 and H2 receptors is not fully known. Aim: Thus, our aim was to review the effects of H1 and H2 receptors on vasodilation during and postexercise. Methods: Only studies in

humans, and written in English or Portuguese were included from our search in Pubmed (13 studies). Results and discussion: After H1 and H2 receptors blockade, vasodilation decreased significantly during and postexercise in sedentary or trained individuals. Furthermore, the effect of the histaminergic receptors seems to be related to the size of muscle mass involved in exercise. This concept is based on the findings that H1 and H2 receptors blockade reduced significantly the increase in blood flow during exercise with large muscle mass, whereas vasodilation was abolished after blockade in exercise with small muscle mass. Conclusion: Histaminergic stimulation of the H1 and H2 receptors is one of the mechanisms involved in the increase of blood flow during and postexercise.

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Área: Fisiologia Geral

Forma de Apresentação: Ê-POSTER

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### **BETAMETHASONE PREVENTS ABORTION CAUSED BY LIPOPOLYSACCHARIDE BUT REDUCES THE WEIGHT OF OFFSPRINGS AT BIRTH**

Infections during pregnancy are risk factors for abortions. We mimic infection during pregnancy with lipopolysaccharide (LPS) and prevent the inflammatory response using a glucocorticoid. Wistar rats (n=6-8 per group) were pretreated with betamethasone (BET; 1.3mg/kg; ip) or vehicle (V) and after 15 min treated with LPS (500µg/kg ip) or SAL (0.9% saline solution; 1ml/kg ip). The rats were evaluated in the open field (OF) followed by euthanasia for blood collection and TNF-α dosage, 2h after treatment. Another set of animals treated in the same way were evaluated for food intake and weight gain over 24h and quantification of abortions (n=16-33 per group). dams that gave birth at term were evaluated for the number of offspring and litter weight. All procedures were approved by CEUA (#66/2017). Treatment with V+LPS reduced the distance traveled in the OF (890±70cm) compared to V+SAL (1520±93cm; p<0.001), and this effect was not changed by treatment with BET+LPS (1022.92±70.33cm). TNF-α concentration was higher in the V+LPS group (1476±292pg/ml) compared to the V+SAL group (261.8±64pg/ml p<0.001), and this elevation was prevented in BET+LPS dams (285.3±71pg/ml). V+LPS dams showed hypophagia compared to V+SAL (9.9±1.6g vs 26.9±2g p<0.001), and treatment with BET+LPS prevented hypophagia (19.3±1.2g p<0.001). The V+LPS dams lost weight (-6.27±2.0g; p<0.001) compared to the V+SAL (+11.4±1.7g), similarly, there was a reduction in the weight of the BET+LPS dams (-11.5 ±1.1g) and BET+SAL (-5.1±1.4g; p<0.001). The incidence of abortions in the V+LPS group (17/33; 51.52% of occurrences) was higher than in the V+SAL group (1/16; 5.56%). BET attenuated the occurrence of LPS-induced abortions (4/19; 17.39%). The birth weight of the BET+LPS (5.42 ± 0.1g) and BET+SAL (5.45 ± 0.2g) pups were lower (p<0.001) when compared to the V+LPS (6.67 ± 0.2g) and V+SAL groups (7.25±0.1g). BET prevented symptoms caused by LPS in dams and reduced abortions caused by LPS, but caused low birth weight.

ID: 5529

Área: Ensino e Divulgação Científica

Forma de Apresentação: Ê-POSTER

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### **HYPERTENSION AS A RISK FACTOR FOR CARDIOVASCULAR OUTCOMES IN HOMELESS PEOPLE IN THE CENTRAL REGION OF SÃO PAULO**

Introduction: Systemic arterial hypertension (SAH) is a major risk factor (RF) for cardiovascular disease (CVD) and is defined as a multifactorial clinical condition characterized by elevated and sustained levels of blood pressure (BP). SAH is a mostly asymptomatic condition. It is associated with metabolic alterations, functional and/or structural maladjustments of target organs, and can be aggravated by the presence of other RF, such as smoking, dyslipidemia, and obesity. When it comes to the homeless population (HP), which is defined as a heterogeneous population group that has poverty and homelessness in common, the risks for CVD development become greater. AIM: To describe the relationship between SAH and the risks for cardiovascular outcomes in the aforementioned population. Methodology: This was an exploratory, cross-sectional, quantitative field study, in which 532 homeless individuals from São Paulo were selected by convenience. They were submitted to a previously structured questionnaire and approved by the institutional Ethics Committee under Protocol 036417, CAAE: 21519413.4.0000.5511, between 2017 and 2020. The sociodemographic profile, presence of RF for CVD was characterized and measurement of blood pressure (BP) and heart rate (HR) were performed. Results: 67% self-reported using alcoholic beverage; 66% are smokers, 11% former smokers; 62% do not practice physical activity. The mean BP was 135x87 mmHg and HR 87 bpm. 36% have been living on the streets for more than five years and 19% between two and five years. Conclusion: We evidenced behaviors in this population that put the integrity of cardiovascular health at risk, confirmed by the tendentially high blood pressure levels. Such findings reinforce the need for studies focused on this population, aiming at greater visibility to this social group and thinking about new effective approaches, thinking about the reduction of cardiovascular morbidity and mortality of this public.

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*Área: Fisiologia Geral*

*Forma de Apresentação: Ê-POSTER*

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### **EFFECT OF CHRONIC PROPHYLACTIC USE OF CFBB-21 ON BODY TEMPERATURE IN SEPTIC RATS**

Sepsis and septic shock are the biggest complications in the ITU due to the complex pathophysiology. Butyrate, a short-chain fatty acid, and molecular hydrogen (H<sub>2</sub>) can attenuate the deleterious effects of sepsis due to its anti-inflammatory effects. The CFBB-21 symbiotic compound produces these two in vitro by-products and has the potential to produce them in its host as well. Knowing this, the objective of the project was to evaluate the benefit of chronic use prophylactic of this new compound in sepsis in rats. Was administered vehicle of CFBB-21 or CFBB-21 via intragastric gavage twice daily day for 8 days. On the last day of treatment, sepsis was induced using the model of CLP (cecal ligation perforation) with 1 hole. For the measurement of body temperature surgery was performed to insert the datalogger in the peritoneum 3 days before the beginning of the treatment. To measure mean arterial pressure, a catheter

was inserted into the femoral artery two days before the experimental day. Septic animals treated with CFBB-21 had an attenuation of the febrile response. treatment with CFBB-21 reversed the hypotension induced by the CLP model. Conclusion: The use chronic prophylactic of this new compound seems to benefit the animal during the sepsis.

ID: 5532

Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### EVALUATION OF THE TOXIC EFFECTS OF ROTENONE ON EARLY STAGES OF DANIO RERIO BY BEHAVIORAL AND MOTOR TESTS

Rotenone (RT) is a natural organic molecule. In excess, it degenerates dopaminergic neurons inducing their death and deforming Lewy bodies. This pesticide is a prototype of exogenous toxin with Parkinson-like clinical attributes in the animal model. Thus, the aim of this work is to evaluate the behavioral and motor parameters of *Danio rerio* larvae exposed to RT. The protocol nº 3581030221 was approved by the CEUA - UFRPE. Larvae (n = 352) with 6 days post-fertilization (dpf) were housed 48 well-plates, divided into 5 groups, control (CG - 0.01% DMSO) and groups exposed to 5, 10, 15 and 20 and µg/L of RT (G5, G10, G15, and G20). The thigmotaxis test (TH) was used to assess anxiety-like behavior, after 10 minutes of acclimatization, it recorded whether the larvae were near or away from the wall. Optomotor response (OMR) data were collected submitting the well-plates with larvae above on the tablet with a video that simulates the water stream to count the number of larvae that followed the stimulus direction (SD). The video, captured by a cellphone camera, consisted of 5s of white to Initial Time (IT), the 30s of alternating lines in the right direction to middle time (MT), and 30s of alternating lines in the left direction to final time (FT). The TH results were compared by one-way ANOVA followed by the Tukey test, and OMR was analyzed by the McNemar test with  $p < 0.05$ . There was a decrease of TH in G15 and G20 compared to CG. The OMR SE rate in IT was CG 24%; G5 35%; G10 26%; G15 and G20 20%. In MT was GC 61%; G5 63%; G10 53%; G15 54%; G20 43%. In the FT was GC 75%; G5 68%; G10 66%; G15 57%; G20 61%. No changes were observed in the OMR test. In our test, RT reduced TH, indicating behavioral changes. OMR test can be used to detect visual impairment thus, RT concentrations did not cause changes in this test. Therefore, RT induced behavioral changes, but not visual impairments.

ID: 5533

Área: Fisiologia de Órgãos e Sistemas: Endócrina

Forma de Apresentação: Ê-POSTER

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## ISOPROTERENOL-INDUCED METABOLIC DYSFUNCTION AND PANCREATIC ISLETS REMODELING IN WISTAR RATS

Studies show that isoproterenol (ISO) promotes functional and morphological change in the heart. ISO is used to bradycardia treatment and cardiac block. Although we know a lot about ISO and cardiac parameters, little is known about the metabolic effects of the ISO. To evaluate the metabolic effects of ISO in Wistar rats. Male Wistar rats, weighing 200 to 250 grams, were divided into two groups: control group (CO), which was administered i.p. saline (0.9%; 0.1 ml/kg/day); and isoproterenol group (ISO, 1mg/kg). The treatment was carried out by seven consecutive days. Both groups had ad libitum access to standard chow and water. The animals were kept under controlled temperature ( $22 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ ) and light/dark cycle (12/12). On the last day of the experimental period, after a 12-hour fast, serum and tissue were collected for morphological analysis. Our preliminary results showed that ISO increased the weight of brown adipose tissue (CO  $91.5 \pm 5.27$  vs ISO  $110.9 \pm 5.52$  mg of BW), did not change the pancreas weight (CO  $315.6 \pm 14.13$  vs ISO  $316.7 \pm 10.88$  mg of BW). However, ISO animals had increased pancreatic islet areas (CO  $11573 \pm 306.8$  N = 13 vs ISO  $18026 \pm 1862 \text{ } \mu\text{m}^2$ ). We observed changes in blood glucose during glucose tolerance test (oGTT; CO  $106.7 \pm 17.23$  vs ISO  $91.33 \pm 17.23$ ). In summary, our results show that isoproterenol promoted pancreatic islet remodeling and disturbed glucose homeostasis. In addition, the animals show an increase in BAT, but no change body weight.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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## THE RELATIONSHIP BETWEEN GENE EXPRESSION RELATED TO OPIOID, GALANIN, AND SEROTONIN SYSTEMS AND SEIZURE MANIFESTATIONS IN WISTAR AUDIOGENIC RATS

The audiogenic kindling (AK) can triggers seizures in Wistar Audiogenic rats (WAR). The AK leads to the development of tonic-clonic seizures, caused by mesencephalic structures recruitment, which can be followed by the recruitment of limbic system structures (LiR). Imbalance in the serotonergic, galaninergic, and opioidergic systems in the dorsal raphe nucleus (DRN) and/or in the hypothalamic-neurohypophysial system were demonstrated to be associated with seizures manifestations in WARs. Also, both galanin (Gal) and dynorphin (Pdyn) were reported as endogenous anticonvulsant neuropeptides. This work aimed to analyze the molecular profile of mRNA expression in the brain structures of WARs after 10 days of AK. We analyzed the Tph1, Tph2, Slc6a4, and Htr1a in DRN; Pdyn and Gal in the hypothalamic supraoptic nucleus (SON) and Htr1a, Htr1b, Htr2a, Htr2c, Galr1, Galr2, Oprk1, and Oprmu1 in the hippocampus (HIP), basolateral and central amygdala (BLA and CeA). A significant reduction was found in Htr1a expression in the DRN of WAR compared to Wistar rats. Additionally, the Tph1, Slc6a4, and Htr1a expressions were increased by AK protocol in both strains. In SON, both Gal and Pdyn expression showed a significant increase in WAR compared to Wistar rats. The Htr1b expression in Hippocampus was reduced, as also the Htr2c in the BLA and Htr2c and Galr1 in the CeA of WARs compared to Wistar. Moreover, the AK increases the expression of Htr2c in the hippocampus and Htr1b and Htr2c in CeA and BLA. The Spearman correlation analysis reveals a negative association between SON Pdyn expression and mesencephalic scores in WAR after AK. Our data point for a possible role of molecular profile related to serotonin, galanin, and dynorphin and its receptors in WARs with impact in their susceptibility

to develop seizures and activate mesencephalic structures and/or recruit limbic ones.

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*Área: Fisiologia de Órgãos e Sistemas: Cardiovascular*

*Forma de Apresentação: Ê-POSTER*

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### **THE ROLE OF CAVEOLAE ON ENOS ACTIVITY IN AORTAS FROM SPONTANEOUSLY HYPERTENSIVE RATS TREATED WITH APOCYNIN**

Apocynin induces greater production of NO associated to the increased eNOS activity in systemic blood vessels of spontaneously hypertensive rats (SHR). We hypothesized that apocynin change cell signaling involving caveolae and eNOS in aortas from spontaneously hypertensive rats (SHR). The aim of this study was analyzed the role of caveolae on eNOS activity in aortas from SHR treated with apocynin. To test this hypothesis, we evaluated the reactivity to Acetylcholine in aortic rings of SHR treated with apocynin, in the absence or presence of methyl- $\beta$ -cyclodextrin (DEX, 10 mmol/L), a drug that disrupts the structure of the caveolae. SHR were treated with apocynin (30 mg/kg, p.o.) from the 4th to the 10th week of life. Wistar rats and SHR not treated with apocynin were used as control groups. We analyzed the vasorelaxant responses of aortic rings to ACh in absence or in presence of DEX or L-NAME (10 mmol/L). DEX shifted to the right and reduced the Emax of concentration-response curves to ACh in aortas of normotensive rats. The same effects were observed when aortas were incubated with to L-NAME. The reactivity of aortas from SHR to ACh is impaired when compared to aortas from normotensive rats. The effects of L-NAME or DEX on the reactivity of SHR aortas to ACh were less significant than those observed in Wistar rat aortas. The aorta reactivity to ACh in apocynin treated SHR was not different from normotensive rats' aortas. However, in aortas from SHR treated with apocynin, DEX or L-NAME did not significantly alter the reactivity to ACh. The results obtained so far suggest that apocynin does not alter cell signaling involving caveolae and eNOS in SHR aorta, despite improving the reactivity to ACh. Possibly, other mechanisms may be involved in improving the reactivity of aortas to ACh in SHR treated with apocynin.

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*Área: Neurofisiologia*

*Forma de Apresentação: Ê-POSTER*

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### **FEAR MEMORY PROCESSING: SEXUAL DIMORPHISM AND LATE CONSOLIDATION IN THE AMYGDALA AND MEDIAL PREFRONTAL CORTEX**

An essential question in the study of memory is what makes different memories vanish or persist. The degree of emotional intensity related to a stimulus is known to influence this matter, but how it

happens remains as an open question. This study aims to investigate whether stimulus intensity at the acquisition of contextual fear memory modulates the plasticity at Amygdala and Medial Prefrontal Cortex (mPFC) at the 12h consolidation time window, besides exploring if behavioral fear expression diverges sexually 1 day and 30 days after memory acquisition. For this, the freezing behavior was assessed 1 and 30 days after the context-conditioned fear protocol in three distinct groups of males and females C57BL/6 (8-16 weeks old): control (US-), low emotional training (1US) and high emotional training (5US). To address the plasticity issue, C57BL/6 males were distributed among the 1US, 5US and naive groups, and euthanized after the 12h time window of conditioning consolidation. Finally, we sought to identify in the Prelimbic (PL), Infralimbic (IL) and Basolateral Amygdala (BLA) regions, known for their involvement in systems consolidation, the expression of Zif268, an activity-dependent transcription factor (CEUA-UFMG: 198/2019). In male mice, fear memory was present 1 day after conditioning in 1US and 5US groups. Nevertheless, only in the 5US group the memory persisted for 30 days. On the other hand, in females, only the 5US group expressed conditioned fear. 12h after training, the 1US group showed significantly more Zif268 expression in mPFC compared to the 5US group. In this regard, no difference was found in BLA. Taken together, our results suggest that contextual fear memory of high emotional value (5US) is associated with diminished plasticity in mPFC during systems consolidation, thus probably resulting in diminished modulation by mPFC over other structures. Such a mechanism may be responsible for the persistence of high emotional memories for and over 30 days.

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Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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## **AEROBIC AND STRENGTH PERFORMANCES OF FEMALE MICE ARE IMPAIRED IN A MOUSE TRANSGENIC MODEL FOR CONGENITAL MYASTHENIA**

Introduction: Congenital Myasthenic Syndromes (CMSs) comprise a rare and diverse hereditary genetic disorder in neuromuscular junction proteins, leading to progressive muscle weakness. Previous studies using Vesicular Acetylcholine Transporter knockdown mice (VKD) expressing only 30% of this protein has demonstrated an impairment in physical performance in male mice. However, it is unknown whether females are also compromised in this model of CMS. Objective: Thus, we aimed at investigating the physical performance and metabolic parameters in female VKD mice over a 3-month period. Methods: Muscle strength (peak force) was measured, every month, by grip strength meter and aerobic performance (i.e., peak oxygen consumption ( $VO_{2peak}$ ), maximum running speed ( $S_{max}$ ) and time to fatigue (TTF)) was evaluated by incremental load test (ILT) in treadmill in both wildtype (WT) and VKD female mice (4- to 6-month-old; ~21g). Glycaemia was also assessed after ILT. All experiments and protocols were approved by The Ethics Committee on Animal Use from UFMG. Results: TTF (85%;  $P<0.05$ ),  $S_{max}$  (74%;  $P<0.05$ ) and  $VO_{2peak}$  (46%;  $P<0.05$ ) were significantly reduced in VKD compared to WT, without changing posttest glycaemia ( $P>0.05$ ). Muscle strength measured in the forelimb (36%,  $P<0.05$ ) and four limbs (28%,  $P<0.05$ ) was impaired in VKD. Conclusion: These results show that female VKD mice present a marked decline in both aerobic and strength performance. We intend to investigate in the future the effects of non-pharmacological treatments, e.g., exercise training and nutrition, to improve physical performance and slow down the progression of the disease in this CMS model.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

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### **MODERATE AND SEVERE FOOD RESTRICTION DURING LACTATION PROMOTES CARDIOVASCULAR CHANGES IN ADULT WISTAR RATS**

Diseases developed in adulthood could be related to conditions that the individual was exposed to in the early stages of life, including lactation. Lactation is an important stage as it is the main source of nutrients for the offspring. To evaluate the effects of moderate and severe food restriction, in the mother, on cardiovascular parameters of the offspring, nutritional intervention was carried out during the first two weeks of lactation. Thus, a control group (NP) where dams were fed a standard chow ad libitum, the moderate restriction group (MR) where dams were fed daily with a 50% of the NP group food intake, and severe restriction group (SR) where dams were fed a low-protein chow (4% protein), were used in this study. At adulthood, blood pressure (BP), heart rate (HR) and baroreflex test were assessed, and the heart was collected for morphological analysis. The protocols were approved by the Ethics Committee of UFG (process n 023/2015). The animals in the MR group showed increased mean (MAP; NP  $107.2 \pm 1.37$ ; MR  $136.6 \pm 6.79$ ; SR  $109.7 \pm 5.54$  mmHg), systolic (SBP; NP  $133.1 \pm 2.55$ ; MR  $170.9 \pm 9.98$ ; SR  $139.5 \pm 5.54$  mmHg), and diastolic blood pressure (DBP; NP  $92.74 \pm 1.65$ ; MR  $119.5 \pm 5.33$ ; SR  $99.55 \pm 4.73$ ) when compared to the NP group. Both MR and SR groups showed decreased baroreflex indexes in the responses to Phenylephrine (NP  $-1.81 \pm 0.22$ ; MR  $-1.18 \pm 0.16$ ; SR  $-1.10 \pm 0.11$ ) and Sodium Nitroprusside (NP  $-4.81 \pm 0.52$ ; MR  $-2.17 \pm 0.21$ ; SR  $-2.17 \pm 0.30$ ). Despite the cardiovascular effects, only MR group showed increased cardiac perivascular fibrosis (NP  $2.69 \pm 0.31$ ; MR  $4.25 \pm 0.46$ ; SR  $2.86 \pm 0.40$ ) when compared to the NP group. Overall, both moderate and severe food restriction in the mother during lactation, induce functional and morphological cardiovascular effects in the offspring at adulthood.

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Área: Fisiologia do Exercício

Forma de Apresentação: Ê-POSTER

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### **THE COMBINED EFFECTS OF HEAT ACCLIMATION AND GLUTAMINE SUPPLEMENTATION ON PHYSICAL PERFORMANCE, PSYCHOPHYSIOLOGICAL PARAMETERS, AND INTESTINAL BARRIER DAMAGE DURING A PROLONGED EXERCISE IN A HOT ENVIRONMENT**

Heat acclimation (HA) and glutamine (GLN) supplementation have been used in isolation to mitigate the adverse effects of environmental heat stress on exercising individuals. This study investigated

the combined effects of HA and GLN supplementation on physical performance, psychophysiological parameters, and intestinal barrier damage during treadmill running in a hot environment. Eighteen volunteers (12 men and 6 women;  $37.3 \pm 8.2$  years) were divided into two groups: HA and placebo; HA and GLN supplementation (CAAE: 97810818.9.0000.5149). The volunteers were subjected to six exercise sessions on consecutive days inside an environmental chamber with a temperature of 40°C. The controlled hyperthermia (i.e., 1.5°C elevation in core temperature) technique was used to acclimate individuals to heat. The volunteers ingested GLN-containing capsules at a dose of 0.15 g per kg body weight or placebo twice daily for seven days. Two days before and after HA protocol, physical tests, which consisted of 10-km running on a treadmill with self-paced intensity at 33°C, were performed. HA reduced the time to complete the 10 km by 6.3% ( $-3.4 \pm 2.6$  min) and psychophysiological strain (e.g., lower skin temperature and higher thermal comfort) in the second compared with the first physical test; however, the increase in the running-induced increase in plasma concentration of I-FABP, a marker of intestinal barrier damage, was not altered by HA. Combining GLN supplementation with HA had little effect on psychophysiological variables (only thermal comfort) and did not alter performance and the I-FABP increase during the 10-km run. We conclude that HA improved performance and reduced the psychophysiological strain caused by exercise performed in a hot environment but did not prevent increased intestinal damage. The strategy of combining the two interventions promotes only occasional adaptations, suggesting that the ingestion of GLN does not facilitate or impair the adaptations caused by HA.

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Área: Fisiologia de Órgãos e Sistemas: Cardiovascular

Forma de Apresentação: Ê-POSTER

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### **IMPACT OF CO-TREATMENT OF THYROID HORMONES AND PURPLE GRAPE JUICE ON PULMONARY VASCULATURE AND RIGHT VENTRICLE IN AN EXPERIMENTAL MODEL PULMONARY ARTERIAL HYPERTENSION**

Adverse vessel remodeling promotes pulmonary vascular resistance, characterizing pulmonary arterial hypertension (PAH), its progression generates hypertrophy and heart failure. The objective was to explore the vascular and ventricular response to co-treatment with grape juice and thyroid hormones (TH) on morphological, echocardiographic and pulmonary artery reactivity parameters in a PAH model. For this 46 Wistar rats,  $\pm 200$ g, were divided into five groups: control, pulmonary hypertension (PAH) and PAH treated with grape juice (PAH + JUICE), PAH treated with thyroid hormone (PAH+TH), and co-treated PAH (PAH+TH+JUICE); the animals received water, grape juice (7 $\mu$ L/g of weight) and/or TH (2 $\mu$ g T3/100g/day and 8 $\mu$ g T4/100g/day, diluted in saline) per gavage, for 14 days. On the 21st day, ultrasound was performed and after euthanasia of the animals, the right ventricle (RV) and pulmonary artery were dissected for analysis of hypertrophy and vascular reactivity (VR). Data analyzed by one-way ANOVA, Tukey post-test, and  $p < 0.05$ . We observed an increase in RV mass and hypertrophy indices in all groups compared to the control. There was a decrease in the acceleration/ejection time ratio in the PAH and PAH+TH+JUICE groups. Only in the PAH group there was a decrease in TAPSE, and the E/A ratio was reduced in the PAH, PAH+JUICE and PAH+TH+JUICE groups. As for VR, the contractile response to phenylephrine, at a concentration of 10 $\cdot$ 8 M, was attenuated in the groups PAH+JUICE and PAH+TH+JUICE, since only the HAP group was different from the control group. However, at low doses of acetylcholine, TH promoted an improvement in relaxation compared to the PAH group. However, in the

different doses of acetylcholine, to verify the vasodilator response, the co-treatment did not bring benefits in relation to the PAH group. We conclude that TH intensified RV hypertrophy, however co-treatment protected against a decrease in TAPSE and promoted some positive effects at the vascular level.

ID: 5547

Área: Fisiologia de Órgãos e Sistemas: Respiratória

Forma de Apresentação: Ê-POSTER

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### AEROBIC TRAINING IN MOTHERS INFLUENCES RESPIRATORY PARAMETERS IN OFFSPRING IN SWISS MICE

Physical exercise can elicit positive responses in various organs and systems in the body. But can physical exercise done by mothers before and during pregnancy have beneficial effects on the respiratory system of their offspring? To answer this question, 72 Swiss mice were used (CEUA UNIFAL-MG 03/2020): 12 females (6 of them performed aerobic training on an automated treadmill) and 6 males. The 54 female offspring generated were distributed into normal litter and reduced litter (obesity induction). The offspring were divided according to the mother's training and obesity induction, into CTA (training), NCTA (non-training), OTA (training and obesity) and NOTA (non-training and obesity). The offspring weight (5 weeks) was  $18.5 \pm 0.4$  and  $22.2 \pm 0.4$ g; respectively for the CTA and OTA groups ( $p < 0.001$ );  $18.8 \pm 0.3$  and  $22.9 \pm 0.5$ g respectively for the NCTA and NOTA groups ( $p < 0.004$ ). The results indicate that there was obesity in the offspring regardless of the mother's training. Subsequently, the animals were anesthetized, tracheostomized and connected to a mechanical ventilator (FlexiVent, SCIREQ, Montreal, Canadá, versão 5.00) to assess the resistance of the respiratory system ( $R_{tot}$ , cmH<sub>2</sub>O.s/mL) and airways ( $R_{aw}$ , cmH<sub>2</sub>O.s/mL), under administration of saline (Sal) or methacholine (MCh). Administered MCh resulted: higher  $R_{tot}$  value for the NOTA group ( $3.37 \pm 0.37$ ) and lower value for OTA ( $1.75 \pm 0.22$ ), where  $p < 0.01$ . This same pattern is seen in the  $R_{aw}$  parameter. These results indicate that the training of mothers can attenuate the resistance caused by obesity in the offspring. However, when we analyze the results of CTA vs NCTA we also see the same trend in the groups mentioned above. Thus, it can be observed that physical activity in mothers, by itself, can also change the resistance in the offspring. These data are quite intriguing and require more experiments for a better conclusion.

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Área: Fisiologia do Exercício

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## **EFFECTS OF THE ASSOCIATION BETWEEN PHOTOBIO-MODULATION AND PHYSICAL EXERCISE ON INSULIN RESISTANCE IN CAFETERIA DIET-INDUCED OBESITY MICE**

The physical exercises are traditional strategy for treating insulin resistance (IR). Photobiomodulation (PBM) has emerged as a new therapy to treat IR associated with obesity. The objective of this study was to evaluate the associated effect of PBM with physical exercise on IR in mice with cafeteria diet-induced obesity. The project was approved by the CEUA of the UFVJM, protocol 004/2020. Male mice (n=64), Swiss albino, 3 weeks old and ~21.5 g, were divided into 2 groups that received commercial chow (Chow, n=10) or cafeteria diet (CAF, n=54) for 14 weeks. In the 9th week, the CAF group was subdivided into: Sedentary (SED, n=10), Exercise 3/3 (EXE3/3, n=22) and Exercise 1/3 (EXE1/3, n=22), each exercise group was subdivided into a Sham group and a PBM group (n=11, each). The Chow and SED groups did not receive PBM or exercise, they were only contained and manipulated in the same way as the treated groups. The animals of the exercise groups were trained with stair climbing exercise, 3 days a week, for 6 weeks, with a certain amount of exercise. The EXE1/3 group received a training volume corresponding to 1/3 of the exercise volume of the 3/3 group. These groups were subdivided into Sham, which performed only physical exercises, and the PBM group, which in addition to exercise received PBM. PBM was performed 3 times a week, immediately after the exercise sessions, for 6 weeks. A malleable mat covered internally with 20 pairs of red (630 nm; 200 mW; 0.9 J) and infrared (850 nm; 400 mW; 1.8 J) LED was used. The application time was 60 seconds. In the 14th week, the animals in the CAF groups were heavier than those in the Chow group ( $p<0.05$ ). The glucose area under the curve in the ipGTT was larger in the CAF groups compared to the Chow group ( $p<0.05$ ) and in the ipITT it was smaller only in the Sham1/3 group compared to the other groups ( $p<0.05$ ). In conclusion, the association between PBM and physical exercise did not promote effects.

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*Área: Fisiologia Celular*

*Forma de Apresentação: Ê-POSTER*

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## **INFLUENCE OF FETAL PROGRAMMING CAUSED BY EXCESS MATERNAL LIPID INTAKE ON THE DEVELOPMENT, STRUCTURE, AND METABOLISM OF THE STRIATED MUSCLE OF THE OFFSPRING**

The variation of nutrients during muscle development can change the patterns of energy acquisition of the offspring, and the increase in lipid intake can change the availability of fatty acid transporters in the maternal fetal barrier, which intensifies the transfer of lipids for the offspring. This study was approved by the Animal Research Ethics Committee of the Federal University of Paraná (CEUA 1303/2019) and aimed to evaluate the effect of supplementation with high doses of polyunsaturated fatty acids on muscle tissue. Thirty female Wistar rats were divided into 3 experimental groups: control (CTL), supplemented before mating, during pregnancy, and lactation with 4 g/kg of omega 3 (SPL3) or omega 6 (SPL6). After weaning the offspring at 21 days of age, the animals were kept without supplementation until the day of euthanasia at 60 days of age. The soleus, extensor digitorum longus, and plantar muscles were submitted to biochemical and morphological analysis. Statistical analysis was performed in the R program (version 4.1.0), data were subjected to exploratory for structural equation modeling through Path Analysis. It is possible to notice a positive effect of muscle characteristics on

the fibers (CF = 5.12;  $p = 0.01$ ) and a negative effect on capillary and nuclear distribution (CF = -4.47;  $p < 0.01$ ), an effect that is also reinforced by the alteration of muscle fibers (CF = -4.97;  $p < 0.01$ ). It is possible to notice a positive effect of fiber alteration on muscle metabolism (CF = 2.05;  $p = 0.01$ ), however, these same characteristics negatively influence the antioxidant system (CF = -1.96;  $p = 0.05$ ) and the accumulation of oxidative damage (CF = -2.74;  $p = 0.01$ ). The increased availability of lipids during offspring development interferes with the differentiation of muscle fibers, changing the pattern of muscle metabolism, leading to a greater generation of reactive oxygen species and tissue damage.

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Forma de Apresentação: Ê-POSTER

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#### **COMPARISON OF THE EFFECT OF STRETCHING AND RESISTANT EXERCISE ON THE PLANTAR MUSCLE REMOBILIZATION PROCESS OF IMMOBILIZED WISTAR RATS**

Immobilization is commonly used for the treatment of injuries to the locomotor system, but the period of restriction promotes a reduction in muscle mass. Various forms of treatment are used to reverse the damage caused during the immobilization period. Therefore, the aim of this study was to compare the effects of resistance exercise and stretching as skeletal muscle treatment protocols in male Wistar rats. All procedures were approved by the Animal Experimentation Ethics Committee (CEUA 1245/2018). 32 Wistar rats were used, divided into 4 experimental groups, which had their pelvic limbs immobilized for 15 days. The animals were euthanized after immobilization (IMOB), after 8 weeks of free remobilization (REMO), stretching (ALON) or resistance exercise (ERES). The plantaris muscle was used for morphological and morphometric analyses. Data matrices were standardized and analyzed by Principal Component Analysis (PCA), and the components were evaluated by one-way ANOVA test and Tukey-HSD post-test. Regarding the "Muscle mass" component, all interventions had a positive size in relation to the IMOB group ( $p < 0.0001$ ). In the "Muscle fiber" components (fiber density, cross-sectional area, minor and larger cell diameters) the IMOB animals had a negative size compared to the intervention groups ( $p < 0.0001$ ). However, they presented higher values in the components "Nuclear Position" (percentage of central cores and core per fiber ratio) and "Nuclear Reasons" (core area per sarcoplasm ratio, myonuclear domain and cross-sectional area of the nucleus), with  $p = 0.01$  and  $p < 0.001$ , respectively. The morphometric analysis showed atrophy induced by immobilization in the plantar muscle, while the free remobilization obtained an improvement, but less organized than the ALON and ERES groups, when considering core and muscle fiber data. Therefore, it is important to try to correct the exercise prescription, so it can be a tool for functional and morphological recovery.

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### **REPEATING OF THE ENGAGEMENT AND PUNCH SPEED TEST IN KARATE**

Assessments need to respect sport specificity, especially physiological responses. However, there is no evaluative protocol that investigates the frequency and speed of punches in karate. We intend to determine the repeatability of the kicking frequency and velocity test (Villani, De Petrillo and Distaso, 2007), adapted for karate punches. Twenty-two athletes were evaluated (male, black belts, 24.5±3.4 yo, 1.73±12.6 m, 68.8±13.8 kg, national team, 7.8±4.6 y. training). The collection was carried out at two different times, with an interval of 48 hours. The protocol consisted of 5 sets of 10 sec. of effort with a direct punch on the contralateral base, with 10 sec. of passive pause between sets. Collections at the start, end and after 10 min. of the variables: heart rate HR (bpm) - Polar® V800 frequency meter and lactate (mmol.L-1) Accusport® lactimeter. Linear measurements of peak velocity PV (m/s), mean velocity MV (m/s), power P (W/kg) and repetitions REP, Peak Power Cefise® were performed. For the reliability measure, after the Shapiro-Wilk test ( $p < 0.05$ ), Spearman's correlation ( $p < 0.05$ ) was applied. The fatigue index (FI), measurement error (ME), repeatability (R), mean standard error (MSE), intraclass correlation coefficient (ICC) and minimum detectable change (MDC), confidence level of 95% were calculated. There were correlations between collection 1 and 2 for: IF ( $r = 0.88$ ;  $p = 0.002$ ), distance from the body to the trimmer ( $r = 0.99$ ;  $p = 0.01$ ), initial HR ( $r = 0.85$ ;  $p = 0.02$ ), FC final ( $r = 0.79$ ;  $p = 0.03$ ), FC after 10 min. ( $0.83$ ;  $p = 0.01$ ),  $\Delta$  FC ( $0.85$ ;  $p = 0.02$ ) and  $\Delta$  lactate ( $r = 0.9$ ;  $p = 0.01$ ). There were positive correlations for PV, VM, P, REP in all series ( $p < 0.05$ ). REP, VP, MV and P values above 7% were identified for EM, 89% for R, 0.79 for ICC, 0.36 for MSE and 0.99 for MDC. The repeatability of the punching frequency and velocity test in karate was adequate for the variables of HR, lactate, power, peak velocity, mean velocity and repetitions.

ID: 5556

*Área: Fisiologia de Órgãos e Sistemas: Endócrina*

*Forma de Apresentação: Ê-POSTER*

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### **EPIGENETIC CHANGES IN THE ADULT PROLE OF RATS EXPOSED TO THE AGROTOXIC MALATHION BEFORE PREGNANCY**

DNA methylation, which occurs predominantly in the context of CpG dinucleotides, is one of the best characterized epigenetic modifications. DNA methylation is mediated by DNA methyltransferases - DNMTs (DNMT1, DNMT3A and DNMT3B) and ten-eleven translocation proteins - TETs (TET1, TET2 and TET3). Bearing in mind that demethylation correlates with transcription and hypermethylation with repression, the analysis of DNA methylation patterns can be used to predict the likelihood of gene expression and health status. Thus, our study sought to evaluate the methylation profile and the expression of genes regulating this process, in the adult offspring (male and female) of rats exposed to the pesticide Malathion before pregnancy. The research relied on the use of 32 adult *Rattus norvegicus* females exposed orally to Malathion, in two different doses 14 mg (M-14) and 140 mg (M-140) per body mass for a period of up to 26 days. A control group was also used and received vehicle (corn oil) as an exposure. After exposure, the animals were mated and the offspring of males and females that came to term were kept until adulthood (90 days) when the animals were then euthanized and the liver was collected for analysis (Protocol CEUA - 5095181116). The analysis of the expression of genes encoding

DNA methyltransferase and demethylase enzymes was performed by Real Time PCR, the statistical data were analyzed using the GraphPad Prism program (GraphPad Software version 8). Our study pointed out that there was hypermethylation ( $p < 0.05$ ) in the LINE1 gene promoter (methylation level marker) in males born to mothers exposed to Malathion regardless of the dose when compared to their control. The observed hypermethylation was accompanied by a reduction ( $p < 0.001$ ) in the expression of this gene in males of the M-140 group. The expression of the DNMTs family genes and TETs proteins was reduced ( $p < 0.001$ ) in males in the M-140 group and in the M-14 group ( $p < 0.01$ ) when compared to their control. Although the offspring of females did not show any difference in methylation of the LINE1 promoter gene, we observed a reduction ( $p < 0.05$ ) in the expression of this gene in the M-140 group. When we evaluated the expression of genes in the DNMTs and TET proteins family, in these females, we observed a reduction ( $p < 0.05$ ) in DNMT1 and TET2 in the M-14 group; And reduction ( $p < 0.01$ ) in the expression of DNMT1, DNMT3A, DNMT3B and TET2 in the M-140 group when compared to the control group. The set of data found so far indicates that the exposure of rats to the pesticide Malathion before pregnancy is capable of modulating the epigenomics of the offspring, especially in adult males. The liver tissue evaluated and its changes in methylation and gene expression suggest that possible losses in metabolic homeostasis may occur, and the investigation of this outcome will be evaluated in the future.

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### THE EFFECT OF FISH OIL OVERNUTRITION DURING PREGNANCY AND LACTATION ON FETAL METABOLIC PROGRAMMING

Maternal nutritional status is a determining factor for events during fetal development. Changes in nutrient intake can alter the offspring's energy acquisition patterns, modifying metabolic preferences, and can lead to imbalances in the antioxidant system, which can negatively affect the gene activation process. This study aimed to evaluate the effect of supplementation with high doses of fatty acids on offspring development and was approved by the UFPR Animal Research Ethics Committee (CEUA 1303/19). Thirty female Wistar rats were used, divided into 3 experimental groups: control (C), supplemented before mating, during pregnancy, and lactation with 4 g/kg of omega 3 (FO) or omega 6 (SO). The offspring were kept until 60 days of age when plasma and collected organs and mesenteric and retroperitoneal adipose tissues and liver were destined for biochemical analyzes related to energy metabolism and antioxidant system. Data were submitted to Principal Coordinate Analysis and compared using the PERMANOVA test with the aid of the R version 3.4.0 program. Offspring FO and SO were overweight ( $R^2 = 0.52$ ;  $F = 14.36$ ,  $p < 0.001$ ), due to their smaller size and higher Lee index and accumulation of adipose tissue when compared to C. Maternal supplementation also promoted the onset of dyslipidemia ( $R^2 = 0.57$ ;  $F = 17.92$ ,  $p < 0.001$ ), in addition to greater lipid damage and reduced defense capacity oxidative ( $R^2 = 0.43$ ;  $F = 10.49$ ,  $p < 0.001$ ). The FO and SO offspring showed alterations in the energy metabolism ( $R^2 = 0.25$ ;  $F = 4.39$ ,  $p < 0.001$ ) and antioxidant system ( $R^2 = 0.57$ ;  $F = 17.92$ ,  $p < 0.001$ ) of the liver. It is noteworthy, therefore, that the increased availability of lipids during the development of the offspring interferes with the pattern of body development, in addition to inducing dyslipidemia in the offspring. As a result of these changes, it is possible to observe metabolic and antioxidant changes in the liver tissue, in addition to promoting tissue damage.

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Área: Neurofisiologia

Forma de Apresentação: Ê-POSTER

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### **ARE THE ASTROCYTES IN THE LATERAL HYPOTHALAMUS/PERIFORNICIAL AREA (LH/PFA) INVOLVED IN THE VENTILATORY RESPONSES TO HYPERCAPNIA IN RATS?**

The Lateral hypothalamus/perifornical area (LH/PFA) is a CO<sub>2</sub>/pH chemosensitive area that participates in the ventilatory response to hypercapnia in a vigilance state and diurnal cycle-dependent manner. Astrocytes located in some chemosensitive areas play an excitatory role in the control of breathing; however, that excitatory function of astrocytes in the LH/PFA was never explored so far. We hypothesized that astrocytes play an excitatory role in the hypercapnic chemoreflex in the LH/PFA and that this action may be dependent on the sleep-wake and light-dark cycle. We injected fluorocitrate [1 mM], into the LH/PFA of unanesthetized male Wistar rats (250-330g) and measured pulmonary ventilation (VE) using a whole-body plethysmograph, together with body temperature (Tb), EEG and EMG during normocapnia and hypercapnia (7% CO<sub>2</sub>), in the light and dark phases. Fluorocitrate's acute effect is the selective depolarization of the cell membrane of astrocytes inducing the liberation of gliotransmitters. All procedures were approved by the Ethics Committee of Use of Animals (CEUA – IBB, UNESP, Botucatu, SP, protocol No. 597-CEUA). Fluorocitrate injected into the LH/PFA increased the ventilatory response to hypercapnia during wakefulness during the light phase (VE= 2397 ± 253 mL/kg/min, n=5 vs 1790 ± 153 mL/kg/min, n=9; P < 0.05) but not during the dark phase (VE= 2555 ± 180 mL/kg/min, n= 4 vs 2311 ± 242 mL/kg/min; n=3; P > 0.05). Our results suggest that the astrocytes, in the LH/PFA may have an excitatory role of the hypercapnic chemoreflex in awake rats during the light phase of the diurnal cycle.

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### **THE GUINEA PIG AS A PRECLINIC MODEL TO STUDY THE IMPLICATION OF THE CAROTID BODY IN THE PATHOGENESIS OF METABOLIC DISEASES**

A novel role for the carotid body (CB), the main sensory organ responsible for hypoxia respiratory reflexes, has been described in rats as a metabolic sensor involved in the pathogenesis of metabolic diseases. Hyperinsulinaemia, hyperleptinaemia, and high levels of proinflammatory cytokines promoted by hypercaloric diets seem to activate the CB producing a sympathetic hyperactivation that would contribute to metabolic diseases [1]. Guinea pig CB is hypofunctional [2] so we hypothesize that in guinea pigs on a hypercaloric diet, the sympathetic cardiovascular and metabolic effects mediated by

CB activation will be blunted or eliminated. The aim of this study was to demonstrate the involvement of the CB in metabolic diseases by showing the absence of metabolic alterations in the guinea pig. To carry out this study, 18 4-month-old male Hartley guinea pigs (ES47186000033/4505502). were divided into three groups: i) one fed with a control diet (C), ii) with a high-fat diet (HF) and iii) with a high-fat/sucrose diet (HFS) for 14 weeks. Several parameters were analyzed by in vivo measurements (weight, plethysmography, haemodynamics, basal glycemia and triglycerides, glucose tolerance test), in vitro fresh tissue measurements (adipose tissue weight, myography, and carotid artery histology), frozen tissues and plasma (catecholamines, insulin and leptin). All the expected results on the metabolic alterations induced by the hypercaloric diet were negative except for sympathetic activation in the HFS group, which was positive, although without affecting any of the effectors explored. The results are compatible with the fact that the guinea pig CB, which lacks hypoxia-induced chemoreceptor activity, is not activated by an increase in insulin or leptin after the administration of hypercaloric diets, as in studies carried out in rats. For this reason, guinea pig could be a good model to study metabolic alterations of neurogenic origin dependent on the activation of the CB.

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