24 JORNADAS ACADÉMICAS

SEPTIEMBRE 25-29, 2017
Instituto de Neurobiología
UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
Instituto de Neurobiología
UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

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Dra. Maricela Luna Muñoz
Coordinador de la Maestría en Ciencias (Neurobiología)

Dra. Brenda Angulano Serrano
Responsable de Doctorado en Ciencias Biomédicas

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Responsable de Posgrado en Psicología

Ing. Ramón Martínez Olivera
Ing. Sandra Hernández García
Unidad de Cómputo

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Inauguración

Septiembre 25, 12:00 hrs.
Ceremonia de Inauguración
Dr. Alfredo Varela Echavarría
Director del Instituto de Neurobiología, UNAM
10:15 hrs.
Dr. Ramón Zúñiga
Centro de Geociencias, UNAM
“Los sismos del 7 y 19 de Septiembre: Causas y Efectos”
12:00 hrs.
Dr. Dardo Tomasí
National Institute on Alcohol Abuse and Alcoholism
“Functional Connectivity Density Mapping”

Conferencias y Actividades

Septiembre 26, 09:30 hrs.
Dr. Robert Dores
University of Colorado
“Tips to get published on an academic journal”

Septiembre 26, 13:00 hrs.
Panel Discussion
“The role of neuroimaging in the study of addictions”
Dr. Sarael Alcauter
Instituto de Neurobiología, UNAM
Moderator

Dr. Dardo Tomasí
National Institute on Alcohol Abuse and Alcoholism
“Sleep deprivation and brain function: dopamine receptors, fMRI activation, and cocaine addiction”

Dr. Eduardo Garza
Instituto Nacional de Psiquiatría, México
“Neuroimaging correlates of improvement after rTMS therapy in crack-cocaine addicts”

Septiembre 26, 15:00 hrs.
Dr. Nora Volkow
National Institute on Drug Abuse
“Imaging the addicted human brain”

Septiembre 27, 12:00 hrs.
Dr. Robert Dores
University of Colorado
“Analyzing the co-evolution of the melanocortin 2 receptor (MC2R) and the accessory protein, MRAP1: is human MC2R a magnificent blunder?”

Septiembre 28, 12:00 hrs.
Dr. Bryan Kolb
Department of Neuroscience
University of Lethbridge
“Principles of plasticity in the developing brain”

Septiembre 29, 11:00 hrs.
Premiación y Ceremonia de Clausura

Septiembre 29, 12:00 hrs.
Dr. Ed Chapman
Department of Neuroscience
HHMI, U. Wisconsin
“New insights into exocytotic fusion pore structure and dynamics”
24 Jornadas Académicas

Presentaciones **Orales**
Alumnos de **Posgrado**

**Septiembre 26, 11:00 hrs.**
Departamento de Neurobiología
**Conductual y Cognitiva**

- **Zeus Gracia Tabuenca**
  “Asymmetries in functional connectivity associated with language and visuospatial abilities”

- **Pau Marco Manclus**
  “Plastic changes induced by sexual experience in female mice”

- **Maria José Olvera Ciatzontzin**
  “The role of glutamatergic activity in the insular cortex during a motivational conflict task: updating from an appetitive memory to an aversive memory”

- **Raúl Rodríguez Crucés**
  “Brain structural integrity and cognitive phenotypes in temporal lobe epilepsy”

**Septiembre 27, 10:00 hrs.**
Departamento de Neurobiología del Desarrollo y Neurofisiología

- **Carlos Alfonso González**
  “Fos-isoforms regulation in Drosophila”

- **Marisol Espinoza Monroy**
  “Sensing the Rhythm: Periodic and Aperiodic Stimuli in Touch, Vision and Hearing”

- **Ana Karen Pimentel Farfán**
  “Neural basis of bimanual coordination”

- **Karla Salgado Puga**
  “Subclinical Doses of an ATP-Sensitive Potassium Channel Blocker Prevent Alterations in Memory and Synaptic Plasticity Induced by Amyloid-β”
Presentaciones **Orales**
Alumnos de **Posgrado**

**Septiembre 28, 10:00 hrs.**
Departamento de Neurobiología
**Celular y Molecular**

Marymar Becerra González
“Response to hypoxic preconditioning of glial cells from the roof of the fourth ventricle”

Dalia Luz de Ita
“Synchronization by daytime restricted food access modulates the presence and subcellular distribution of β-catenin and its phosphorylated forms in the rat liver”

Emmanuel Labrada Moncada
“Functional expression of GABA-A receptors in glial cells from the cerebellar white matter”

Juan Pablo Robles
“Structural analysis of Vasoinhibins: A molecular dynamic simulation approach”
24 JORNADAS ACADÉMICAS

Jueces Participantes

Aceves Velasco Carmen Y.
Aguilar Ayala Yaneri
Batagelio Daniella
Bedos Marie
Bosch-Bayard Jorge
Cadena Valencia Jaime
Carranza Salas Martha E.
Castilla Alejandra
Castro Zapata Analía
Corona G. Rebeca
Cruz Alaniz Yuría
De Lafuente Flores V. Hugo
Delgado G. Evangelina
Domínguez Frausto César Arturo
Elias Adrián Jefte
Espino Saldaña Ángeles Edith
González Gallardo Adriana
González Hernández Abimael
González Isía Arturo
González Leopoldo
Harmony Baillet Thalia
Hernández Cortés Adán
Hernández Ríos Elsa Nydia
Jeziorski Michael Conrad
Larriva Sahd Jorge A.
Lazcano Sánchez Iván
Lozano Flores Carlos
Luna Muñoz Maricela
Macotela Guzmán Yazmin

Martínez Cabrera Gema
Martínez de la Escalera Lorenzo Gonzalo
Martínez Matehuala Felipe
Medina Fragoso Andrea Cristina
Méndez Hernández Isabel C.
Mendoza Trejo Soledad
Merchant Nancy Hugo
Muñoz Mayorga Daniel Eduardo
Nava Pinto Gabriel
Olivares Rafael
Ortiz Retana Juan José
Palma Tirado Lourdes
Pasaye Alcaraz Erick Humberto
Patricia Villalobos
Peña Rangel Teresa
Prado Alcalá Roberto Agustín
Prado Loza Luis Antonio
Ramos Aguilar Ma. Eugenia
Regalado Ortega Mirelta
Rodríguez Córdova Verónica
Rodríguez Ortiz Luis Roberto
Rojas Piloni Gerardo
Rueda Orozco Pavel Ernesto
Thebault Stephanie
Vázquez Cuevas Francisco
Ventura Eli
Vera Rivera Ángela Gabriela
sesión 1: septiembre 25, 16:00 a 19:00 h.
carteles exhibidos: 1 al 51

sesión 2: septiembre 26, 16:00 a 19:00 h.
carteles exhibidos: 52 al 102

sesión 3: septiembre 27, 16:00 a 19:00 h.
carteles exhibidos: 103 al 152

los resúmenes incluidos en esta memoria son responsabilidad de sus autores.
1. MONKEYS SHARE WITH HUMANS THE NEUROPHYSIOLOGICAL BASIS FOR ENCODING SOUND PERIODICITIES CAPTURED BY THE FREQUENCY-FOLLOWING RESPONSE

Ayala YA\textsuperscript{1}, Lehmann A\textsuperscript{2}, Prado L\textsuperscript{1}, Luna R\textsuperscript{1}, Merchant H\textsuperscript{1}

\textsuperscript{1}Department of Behavioral and Cognitive Neurobiology, Institute of Neurobiology, UNAM, Juriquilla Campus, Mexico.
\textsuperscript{2}International Laboratory for Brain, Music and Sound Research (BRAMS), Center for Research on Brain, Language and Music (CRBLM) and Department of Psychology, University of Montreal, Montreal, QC, Canada.

The extraction and encoding of acoustical temporal regularities are fundamental for human cognitive auditory abilities such as speech or beat entrainment. The level of hierarchy at which the auditory system can extract rhythmic information from acoustically complex sounds seems to vary across species. Hence, here we compared the neural representation of auditory periodicities between human and non-human primates by obtaining the scalp-recorded frequency-following response (FFR) potential. We found that rhesus monkeys can resolve the spectrotemporal structure of periodic stimuli to a similar extent as humans by exhibiting a homologous FFR potential to the speech syllable /da/. In addition, we found comparable phase-locking and inter-trial consistency in the FFR of both species which are response properties that correlated with individual differences in literacy and beat entrainment abilities in human subjects. Overall, our results reveal a conserved neural ability to track acoustical regularities within the primate order. Furthermore, our work opens the possibility to study the neural basis of processing of acoustic periodicities in behaving monkeys to understand the role of temporal regularities in rhythmic entrainment, language and literacy.

This work was supported by DGAPA-UNAM Postdoctoral Fellowship to YAA and by CONACYT-236836, CONACYT-196, and PAPIIT-IN202317 grants to HM. Authors thank Raúl Paulin for their technical assistance.

2. SULPIRIDE PROTECTS AGAINST DIABETIC RETINOPATHY IN RATS BY INCREASING SYSTEMIC PROLACTIN AND THE ACCUMULATION OF OCULAR VASOINHIBINS


Departamento de Neurobiología Celular y Molecular, Instituto de Neurobiología, Universidad Nacional Autónoma de México (UNAM), Campus Juriquilla, Querétaro, México.

Diabetic retinopathy (RD), an ocular complication of diabetes mellitus (DM), is the leading cause of irreversible blindness and visual impairment among working-age adults. In RD damage to the retinal microvasculature results in excessive vasopermeability and vascular proliferation (angiogenesis) that compromise vision. Vasoinhibins, a family of 12 to 18 kDa fragments derived from the proteolytic cleavage of the hormone prolactin (PRL), inhibit angiogenesis and decrease vasopermeability in experimental diabetes. Here, we used the drug sulpiride, an antagonist of dopamine type 2 receptors, that induces hyperprolactinemia, with the hypothesis that high levels of systemic PRL result in the increase of ocular vasoinhibins able to counteract the progression of RD. Daily intraperitoneal (i.p.) injections of sulpiride induced hyperprolactinemia in a dose-dependent manner, with the highest dose (20 mg/Kg) leading to maximal serum PRL levels (117±10.6
ng/mL). We also demonstrated that ocular vasoinhibins increased in sulpiride-treated animals, as indicated by the presence of 16 and 14 kDa PRL-immunoreactive proteins in the vitreous of sulpiride-treated animals that were not found in the absence of the drug. Sulpiride administered for 2 weeks after 4 weeks of having induced diabetes with a single i.p. injection of streptozotocin (STZ) blocked the diabetes-induced increase in retinal vasopermeability evaluated by the Evans blue assay. Sulpiride did not affect retinal vasopermeability in non-diabetic controls or the glucose circulating levels of all animals. Sulpiride is a prokinetic drug used in diabetic patients that may be a desirable therapy for DR due to its hyperprolactinemic effect leading to elevated levels of intraocular vasoinhibins.

We thank Fernando López Barrera, Gabriel Nava, Martín García, Alejandra Castilla, Daniel Mondragón, and Antonio Prado for technical assistance. Supported by CONACYT grant 247164.

3. ASSESSMENT OF MANGANESE CHLORIDE DOSES IN BEHAVIORAL AND MRI EXPERIMENTS

Aguilar Moreno J. Alejandro; Gasca Martínez, Deysi; Ortíz Juan; Alcauter Solórzano Sarael; Paredes G. Raúl G.
Laboratorio de conducta sexual y plasticidad; Unidad de Análisis Conductual; Laboratorio Nacional de Resonancia Magnética. Instituto de Neurobiología (INB), UNAM Campus Juriquilla, Querétaro.

Introduction: Manganese enhanced magnetic resonance imaging (MEMRI) is a technique that provides structural and functional brain activity by enhancement of magnetic resonance (MR) signal. Manganese (Mn+2) is an analogue of calcium (Ca+2), that can enter the excited cells through Ca+2 dependent channels. Since Mn+2 is a paramagnetic ion, it modifies the local magnetic field, changing the longitudinal relaxation time (T1) of the tissue where accumulates, producing contrast in MR images. There is evidence indicating that at high doses Mn+2 could lead to neurotoxicity effects, affecting the motor skills of the subject with Parkinson’s disease-like symptoms.

Objective: For the adequate use of MEMRI, we first need to find a dose that does not affect the behavior of the subject and that has enough MR contrast to identify the active structures during the behavioral (in this case copulatory) sessions.

Method: We used 45 female Wistar rats, 250-300grs, without previous sexual experience. They were ovariectomized and supplemented with hormonal treatment and randomly assigned to the following groups: Control (saline), MnCl2 8mg/kg and MnCl2 16mg/kg. Females were tested for sexual behavior in conditions where they control the rate of sexual interaction (paced) for 30 minutes. Immediately thereafter they were exposed for 30 minutes to a running wheel. Finally, they were evaluated in a rotarod. Subjects were tested in the same behavioral sequence once a week for 10 weeks. MnCl2 was administered s.c. on sessions 1, 5 and 10. An additional group was injected with the same MnCl2 indicated doses and tested for sexual behavior in the same time frame and scan in weeks 1, 5 and 10.

Results: The results show that 16mg/kg of MnCl2 does not affect sexual behavior, running wheel or the rotarod test, indicating that this dose can be used for future studies because it does not produce behavioral alterations and we obtained a good MR signal.

Acknowledgments: Francisco Camacho for his technical assistance.
This research was supported by CONACYT 253631, Fronteras 374 and PAPIIT IN210215.
Alternative splicing is a molecular process by which a single genetic locus produces several transcripts capable of generating protein isoforms with diverse functions and localized expression patterns. Interestingly, many transcription factors are processed through alternative splicing, as is the case of the gene \textit{kayak}, the \textit{Drosophila} homolog of the evolutionarily conserved \textit{Fos} genes. Found originally in a mouse osteosarcoma, \textit{Fos} family transcription factors, containing a leucine zipper dimerization domain, have been studied mainly in several morphogenetic processes in the fly embryonic development, and in gain-of-function phenotypes in vertebrate oncology. In mammals, the \textit{Fos} gene family comprises four different genes with eighteen different isoforms that possibly exhibit partial redundancy, making functional assessment difficult. However, in \textit{D. melanogaster}, the sole \textit{Fos} homolog is \textit{kayak}, a single gene with 6 isoforms. \textit{kayak} loss-of-function mutant alleles are embryonic lethal, allowing \textit{Fos} multiple requirements to be studied \cite{Riesgo-Escovar.1997}. \textit{kayak} is a pleiotropic gene, suggesting isoform-specific functions. Despite this, there is very little information regarding the roles played by the different isoforms. We want to broadly understand the different roles played by \textit{kayak} isoforms in development. We firstly evaluated the expression of \textit{kayak} (\textit{kay}) isoforms in wild-type embryos and in \textit{kay} mutant alleles (\textit{kay}1, \textit{kay}2, \textit{kay}200, \textit{kay}640) using RT-qPCR with isoform-specific primers. We also sought to establish a relationship between isoform expression and mutant phenotypes. For this, we developed a new method based on the ImageJ plug-in \textit{EggTools}. This allows us to accurately quantify morphological mutant egg phenotypes. Results show significant differences between mutant alleles, allowing mutant alleles separation and construction of an allelic series, and general reduced expression of \textit{kay} isoforms RG and RF.

\cite{Riesgo-Escovar.1997}

\section{5. CREB PHOSPHORILATION (SER133) IN THE ANTERODORSAL STRIATUM AFTER INTENSE AND MODERATE TRAINING IN INHIBITORY AVOIDANCE TASK}

intense training is the increase of intensity of foot-shock in inhibitory avoidance (IA) training, which produces a strong and persistent memory that is highly resistant to extinction. Intense training protects memory consolidation against the amnestic effects of pharmacological treatments in the striatum. The phosphorylation status of the cyclic AMP (cAMP)-responsive element-binding protein (CREB) is an indicator of its transcriptional activity and the gene expression in memory consolidation. Two groups of adult male Wistar rats were trained in IA using different intensities of foot-shock (1.0 or 3.0 mA), and an additional group was trained without foot-shock (0.0 mA). Also, other two control groups were studied, one received the higher foot-shock (3.0 mA) without training and another was intact group. The rats were sacrificed 1 h after training for immunohistochemical detection of phospho-CREB ser133 (p-CREB) in the ventral and dorsal striatum. The results showed a higher p-CREB ratio in the ventral striatum, but not in the dorsal striatum. Also, p-CREB ratio showed a lateralization; the right hemisphere had not a clear correlation between the p-CREB ratios towards the intensity of training, the left hemisphere showed a higher p-CREB ratio in the 1.0 mA group with respect to the other groups. A higher p-CREB ratio was not found in neurons of the intense
training group. These results suggest that memory consolidation of intense training does not activate the genomic mechanisms.

We thank to Bertha Islas, Norma Serafín, Martín García, Alejandra Castillo, Alberto Lara, Ramón Martínez, Nydia Hernández and Leonor Casanova for excellent technical and experimental assistance. This research was supported by grants PAPIIT IN201415 y CONACyT 237570. L

6. METABOLIC CHARACTERIZATION OF TWO Drosophila melanogaster INSULIN PATHWAY MUTANTS

Alvarez-Rendón, J. P. & Riesgo-Escovar, J. R.
Departamento de Neurobiología del Desarrollo y Neurofisiología, Instituto de Neurobiología, UNAM.

Diabetes encompasses a group of metabolic disorders generally characterized by hyperglycemia, resulting from defects in insulin signaling in the organism. In this study, we used Drosophila melanogaster as a model organism to study the disease throughout the lifecycle of the organism. Drosophila possesses many advantages for such a study having a short life cycle, and the availability of a wide range of genetic tools for its use. We characterized different metabolic parameters; chiefly, levels of lipids, sugars, and activity levels of insulin pathway mutants and controls at different ages of adult flies (at 1, 10, 20, and 30 days) in both sexes. The strains used harbor mutations in the InR (the insulin receptor fly homologue), and Dp110 (the catalytic subunit of phosphoinositol 3 kinase fly homologue) genes, part of the insulin signaling cascade. The results obtained show a significantly decreased level of activity in Dp110 mutant females compared to wild flies. In addition, there were higher levels of lipids and carbohydrates per milligram of weight in the mutants, and the phenotype was more severe in InR mutants compared to Dp110 mutants. Since InR sits upstream Dp110 in the insulin pathway, defects in its functioning may have wider phenotypic consequences than defects in Dp110. Males also showed higher carbohydrate and lipid levels compared to females. A common pattern was also observed in all groups: carbohydrate levels were highest at the beginning and end of adult life timepoints measured, and lipid levels were higher in the middle ages. The detailed description of these mutant strains and the ways in which their metabolic parameters vary at different ages highlights the importance of considering these variations as influences in the response to different treatments or challenges when studying diabetic organisms.

Financing: Papii # IG200216 to JRR-E. (M)

7. TRUNK BIOMECHANICS ANALYSIS PROTOCOL AS A DIAGNOSTIC TOOL FOR CHRONIC NON-SPECIFIC LOW BACK PAIN

Aranda-González CF², Martínez-Matehuala F¹², Juárez-Colín ME¹, Bosch-Bayard J¹, Carrillo-Prado C², Arriaga-Aguilera A², Harmony T¹.
¹Laboratorio Universitario de Biomecánica, Instituto de Neurobiología, UNAM Campus Juriquilla, Querétaro, México, ²Escuela Nacional de Estudios Superiores, UNAM, Unidad León

Biomechanics is the study of movement of living organisms based on the laws of mechanics. Chronic non-specific low back pain is a multifactorial disease located in the lower gluteal fold that can irradiate and/or produce functional limitation of daily life activities which cannot be related to a particular injury.

Objective: In this study, we assess whether a new trunk biomechanical analysis protocol designed by us was able to find differences in trunk, thoracic and lumbar spine kinematics between a control group and a
chronic non-specific low back pain group. Methods: The subjects performed randomly seven movements with ten repetitions each, the movements are anterior flexion, lateral trunk side-bending (left and right), rotation (left and right) and anterior trunk flexion with left and right rotation. For each repetition, the range of motion was calculated between the reference systems created in C7, T12 and S1, which allowed us to segment the trunk and obtain angular and spatio-temporal variables.

**Results:** The results showed significant differences (p <0.05) in the maximum movement in the thoracic spine (TC) and lumbar spine (CL) segments in the flexion movement, flexion with right and left rotation and right rotation. These results suggest that the biomechanical analysis protocol is able to detect differences in trunk kinematics.

**Conclusions:** This diagnostic tool could be useful in different spine pathologies within the clinical field. The protocol provides quantitative information which can help develop specific treatments for patients and monitor their progress.

Acknowledgment: M en I Adrian Elias; Proyecto PAPIIT IN200917. (L)

8. VASOINHIBINS PROMOTE APOPTOTIC CELL DEATH IN HIPPOCAMPAL NEURONAL PRIMARY CULTURES

Aroña Rodrigo Manuel¹, Arnold Edith¹², Macías Fernando¹, Ulloa Miriam¹, Rivera Josué¹, Clapp Carmen¹, Martínez de la Escalera Gonzalo¹.

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Vasoinhibins (Vi) are a family of peptides derived from prolactin that have been shown to act on endothelial cells blocking angiogenesis via inhibition of proliferation and inducing vaso-obliteration through apoptosis. Similarly to other angiogenic regulatory factors, Vi can modulate some functions of the Nervous System. Vi act in the Central Nervous System promoting anxiety and depression behaviors. Additionally, Vi suppress the neurotrophic effects of vascular endothelial growth factor (VEGF) in primary sensory neurons. Both, anxiety and depression, as well as the inhibition of VEGF actions have been associated with hippocampal neurodegeneration. Thus, in the present study we explored whether Vi affect hippocampal neurons. To explore the actions of Vi on neuronal cells, primary hippocampal neurons were isolated from the brain of E16 mice and cultured on plates or coverslips treated with poli-L-lysine. On DIV1 hippocampal cultures were treated with increasing concentrations of Vi (5, 10, 20, 40 nM) for up to 72 hours (DIV1-DIV4) or with a concentration of 20 nM for up to 16 and 24 hours. Incubation of hippocampal cultures with Vi reduced the cell number in a dose-response manner, evaluated by immunocytochemistry for βIII-tubulin, a neuronal marker. Vi induced the activation of caspase 3 at 16 and 24 hours after treatment, evaluated by immunocytochemistry for cleaved caspase 3. Moreover, Vi increased the expression of genes involve in apoptosis, such as CASP3, the transcription factors FOXO1 and FOXO3, and the members of the Bcl-2 family BAD, BAX, BIM and PUMA, evaluated by qRT-PCR.

Altogether these findings show that Vi are capable to induce the apoptosis of hippocampal neurons and suggest that it occurs via the activation of the apoptotic mitochondrial intrinsic pathway, remaining to demonstrate the role of transcription factors FoxO1 and FoxO3 in this mechanism.

Acknowledgments: We thank Gabriel Nava, Fernando López, Elsa Nydia Hernández and Alejandra Castilla for their technical assistance. Supported by CONACYT grants 251 and 251509. D
9. SWIMMING REDUCES MOTOR AND COGNITION AFFECTIONS CAUSED BY EXCITOTOXIC INJURY WITH NMDA IN THE CORPUS CALLOSUM OF THE NEONATAL RAT

Arrazola Cortés A.R.¹, Espinosa-Jeffrey A.², Harmony Baillet T.¹, Arellano R.O.³ and Quirarte G.L.¹
¹Departamento de Neurobiología Conductual y Cognitiva, Instituto de Neurobiología, UNAM
²Research on Intellectual and Developmental Disabilities. UCLA, Semel Central Institute, and
³Departamento de Neurobiología Celular y Molecular. Instituto de Neurobiología, UNAM.

Periventricular leukomalacia (PVL) is a pathology which can be developed in premature babies by several risk factors such as hypoxic/isquemic, intracranial hemorrhage and perinatal infection. These risk factors can cause cell death by excitotoxicity in the gray and white matter of the brain. The Katona’s neurohabilitation has been implemented to reduce behavioral affections by gray and white matter injuries. Nevertheless, the mechanisms that interact in brain recovery are largely unknown. With the intention to produce a perinatal white matter lesion similar to PVL in the rat, we injected acid-N-metil-D-aspartate (NMDA) into corpus callosum in the 5th postnatal day. Rats were divided into three groups: Intact, vehicle and NMDA. Subsequently we divided the groups into two subgroups: sedentary and swim (Intact-sedentary, Intact-swim, Vehicle-sedentary, Vehicle-swim, NMDA-sedentary and NMDA-swim). We put them to a swim protocol from the 7th to the 30th postnatal day. We evaluated in the open field their horizontal and vertical activity in the age of 25, 30 and 40 postnatal days. At the 40th postnatal day, we also evaluated object recognition learning. The NMDA-sedentary group developed hyperactivity, which is diminished in to NMDA-swim group. In conclusion, the swimming from day 7 to postnatal day 30, has the capacity to diminish the affections in the behavior cause by an excitotoxicity injury.

We thank Jorge Larriva, Claudia Goméz Roberto A. Prado-Alcalá, Norma Serafín, Cristina Medina, Leonor Casanova, Sandra Hernández, Martín García, Alejandra Castilla and Deyes Gasca. CONACyT (Grants 218556, 166772 and 251634, Beca 621147/331013 and PAPIIT-UNAM (IN621147 and IN200917).

10. PROLACTIN STIMULATES POSTNATAL LIVER GROWTH

Departamento de Neurobiología Celular y Molecular, UNAM Campus Juriquilla, Querétaro, México.

The liver is a vital organ that accounts for 5% of the body weight in adults. This proportion changes during prenatal and postnatal development and at adult stages demanding liver function, such as pregnancy and lactation. Prolactin (PRL) promotes adult liver growth and contributes to the physiological regulation of pregnancy and lactation, but there is no information on whether PRL stimulates developmental liver growth. To analyze the effects of PRL on postnatal liver growth we evaluated liver to body weight (LBW) ratio, PRL circulating levels, PRL and PRL receptor (PRLR) liver expression, and the liver expression of proliferation and angiogenesis markers in wild type mice (Prlr+/+) and PRLR null mice (Prlr-/-) at postnatal (PN) weeks 0, 1, 2, 4, 6. In wild type mice, LBW ratio is low (3%) during the first two PN weeks and increases thereafter reaching maximal levels (5%) at PN week 4. PRL is expressed in the liver during the first two weeks after birth and is undetectable thereafter. The PRL receptor is upregulated in the liver at PN week 2; whereas the circulating PRL levels begin to be detected after PN week 2, reach their highest levels at PN week 4 and decrease to adult levels thereafter. These findings indicate that postnatal liver is always under the influence of PRL. Consistent with this notion, we show that the LBW and the liver expression of proliferation (cyclin D1) and angiogenesis markers [CD-31 and vascular endothelial growth factor (VEGF)] are significantly reduced in Prlr-/- null mice vs. Prlr+/+ mice at PN weeks 1,4, and 6. These results support the role of PRL as a...
physiological promoter of postnatal liver growth via the local and systemic stimulation of liver cell proliferation and angiogenesis.

We thank Gabriel Nava, Fernando López Barrera, Adriana González, Martín García, Alejandra Castilla, Antonio Prado and Daniel Mondragón for their technical assistance. This work was supported by the Nacional Council of Science and Technology of México (CONACyT) grant 220574.

11. NEUROPROTECTIVE EFFECTS OF GH AND IGF-1 TREATMENTS AFTER HYPOXIC-ISCHEMIC INJURY IN CHICKEN CEREBELLAR CELL CULTURES

Department of Cellular and Molecular Neurobiology, Institute of Neurobiology, UNAM Campus Juriquilla, Querétaro, México.

Perinatal hypoxic–ischemic (HI) brain damage is a major cause of mortality and long-term neurological impairment in children. The fast growth of the cerebellum in the last half of fetal development makes it vulnerable to a HI injury.

Growth hormone (GH) and insulin-like growth factor-1 (IGF-1) are upregulated in different brain areas such as hippocampus, cortex, retina and cerebellum after damage by hypoxia. Moreover, GH and IGF-1 treatments are able to induce neuroprotection and neural-regeneration in the CNS. In this study, we evaluated the effects of GH and IGF-1 treatment (1 nM and 40 nM respectively) on cell survival after an acute HI injury in primary cell cultures of embryonic chicken cerebellum. In addition, we evaluated the relevance of cerebellar GH expression in hypoxic conditions through gene silencing by small interfering RNA (siRNA). To induce neural damage, cerebellar cell cultures were maintained in hypoxic conditions (0.5-5% O2), and incubated in low glucose media (1 g/L) (HLG) for 12 h, and later subjected to 24 h of reoxygenation.

We observed that incubation of cells in HLG caused a significant decrease in cell viability (54.1 ± 2.1 %), an increase in caspase-3 activity (122.0 ± 4.5 %), and LDH release (529.7 ± 97.3 %), while treatment with GH increased cell viability (77.27 ± 4.1 %), and decreased caspase-3 activity (105.0 ± 3.9 %) and LDH release (172.7 ± 16.7 %), whereas IGF-1 treatment only increased cell viability (72.3 ± 3.9 %) without affecting apoptosis and necrosis. After incubation in HLG conditions, cerebellar cell cultures increased GH and IGF-1 mRNA expression (by 3.2 and 2.7 fold, respectively). GH gene silencing decreased both, GH (1.7 fold) and IGF-1 (0.5 fold) mRNA expression in the HLG group, suggesting that GH regulates IGF-1 expression under HLG conditions. GH gene silencing significantly decreased cell viability (35.9 ± 2.1 %) and increase LDH release (1011.0 ± 276.6%), and IGF-1 treatment recovered cell viability (53.7 ± 3.2 %) and decreased LDH release (421.7 ± 62.2 %). Our results showed that both, local and exogenous GH act as a neuroprotective factor, at least partially through IGF-1 under HLG conditions.

We thank Gerardo Curtos, Nydia Hernández for technical assistance.
This work was supported by PAPIIT-DGAPA UNAM (IN201817, IN206115, IA200717), CONACYT (696979) and Pilgrim Pride.
12. COMPARATIVE STUDY OF CEREBRAL FUNCTIONAL CONNECTIVITY BETWEEN PATIENTS WITH OBSESSIVE-COMPULSIVE DISORDER WITH SYMPTOMS OF WASHING AND CHECKING AND CONTROL SUBJECTS

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Introduction: Obsessive-compulsive disorder (OCD) is a neuropsychiatric disorder characterized clinically by the presence of recurrent intrusive thoughts and repetitive ritual behaviors that cause significant discomfort in subjects suffering from it. The clinical characteristics of OCD are phenotypically heterogeneous, those subjects can manifest four dimensions of symptoms: washing, checking, symmetry and hoarding. Neuroimaging studies have emphasized structural and functional abnormalities within the cortical-striatal-thalamic-cortical circuits (CSTC) in OCD patients, there is also evidence of different cerebral regions that underlie the different symptoms dimensions. In recent years, new studies have been carried out showing the functional brain connectivity, in which the alterations were identified in brain regions outside the CSTC circuit. Although it is not clear how these alterations are involved in the pathophysiology of OCD, we hypothesize that it could be associated with the heterogeneity of symptoms. The aim of the present study is to compare the functional connectivity of OCD patients with different symptoms dimensions and control subjects.

Method: Nine participants were evaluated through a structured neuropsychiatric interview. Three subjects met the criteria for the diagnosis of OCD (aged 22 to 27 years) according to DSM-5. Two of them manifest washing symptoms and the other checking symptoms. The remaining six subjects were control subjects. To perform the neuroimaging studies, a 3.0T Magnetic Resonance Imaging was used. All subjects were in the resting state for 10 minutes with eyes closed. Functional connectivity analysis was performed using CONN tool of the statistical parametric mapping software.

Results: We observed that the OCD group has different functional connectivity of the fronto-parietal network. Similar differences were also present between the subjects with symptoms of washing and checking.

Conclusions: Preliminary results support the hypothesis that functional brain connectivity varies according to the different symptoms dimensions. However, it is important to increase the sample to support the results.

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13. NORMALIZATION AND VALIDATION OF PSYCHOMOTOR DEVELOPMENTAL ASSESSMENT TEST


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Introduction: Psychomotor developmental assessment test (PDAT) was designed as a screening test to measure development in Mexican infant population from 1 to 36 months, in reference to Psychomotor development (PD) principal domains, Gross (GM) and Fine (FM) motor skills, Cognitive (C) and Language (L). Therefore, PD is influenced by several factors as genetic, biological and environmental, which modify and lead to improve milestones into complex ones or, on the contrary, decrease or slow PD. Objective: Identify items from each category with a normal distribution in order to describe the standard development curves for each domain. Establish the correlation between categories and highlight some socioeconomically factors. Method: Apply PDAT to infants from 1 to 36 months age from IMSS daycare centers in Querétaro city and consult of their file (family income, stayed in daycare centers, medical record). Shapiro-Wilk normal distribution test was conducted and percentile data was acquired, besides correlation test between categories. Results: Based on 1,057 evaluations: 18/36 months for Gross and Fine motor skills, 24/36 months of Language and 19/36 for Cognitive had a normal distribution. The results for correlations can be considered acceptable (MG-L r=0.976; MG-C r=0.982; MF-L r=0.963; MF-C r=0.967; L-C r=0.977, p=0.01). Socioeconomical aspects obtained (n=450 mothers) are: mother’s age (m=29.5, 17-42), mothers with bachelor’s degree (n=31), children per family (m=1.9, 1-5), time at daycare (m=7.27, 3-10 hours) and days off per week (m=1.65, 1-3), monthly family income (m= $8,655.53, $3'598-41'252.52). Conclusion: The PDAT is a screening test which has a high correlation between categories. According to the results, PDAT can only be used to provide an approximation of development status of an infant and is still on process to achieve normal distribution for each category. Consequently, is crucial to measure the construct validity of each item, in order to reach validity and reliability as a measuring instrument of PD for Mexican infant population. Is imperative to include in further investigation, samples of population with different social and economic level.

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14. RESPONSE TO HYPOXIC PRECONDITIONING OF GLIAL CELLS FROM THE ROOF OF THE FOURTH VENTRICLE

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The cerebellum harbors a specialized area located on the roof of the fourth ventricle, composed by glial cells, neurons, oligodendrocytes and what are thought to be glial/neuronal precursors, immunopositive for nestin and GFAP (glial fibrillary acidic protein). This area is accompanied by a cellular niche composed of GFAP+ and nestin+ cells, named “VMC” (Ventricule Medial Cord). It is distributed along the midline of the lobe I in a streak-like manner and its function is yet to be determined. Under hypoxic preconditioning (HP), GFAP+/nestin+ cells from the adult brain (cortex and the auditory nerve), proliferate and differentiate. Therefore, our
main objective was to determine whether the GFAP+/nestin+ cells of the VMC respond to HP. Mice underwent 3 cycles of oxygen deprivation. One mouse was introduced inside a 50mL capped tube until gasping was observed, then allowed to recover before repeating two more cycles. After 1 to 7 days, brains from GFAP-GFP (Green Fluorescent Protein) transgenic mice were: 1) clarified and observed under confocal and light sheet microscopes, 2) processed for Golgi staining, 3) processed for immunofluorescence (NeuN and Iba1) and, 4) homogenized for protein isolation and WB (Western blot). In GFAP-GFP mice, GFP expression is under GFAP promoter control, thus the intensity of fluorescence reported changes in the expression of GFAP. To determine cell proliferation after HP, BrdU was injected and detected by immunofluorescence.

After HP, the number of GFP+ Bergmann Glia (BG) and GFP+ cells in the VMC decayed until day four after which rebounded by day seven. BG somas became smaller and the absolute protrusion length of their processes increased. Immunofluorescence revealed increase in the NeuN+ cells (neurons) and morphological changes of Iba1+ cells (microglia), WB showed an increase in the expression levels of NeuN, Iba1 and nestin and a decrease in GFAP. Slight incorporation of BrdU was detected. This evidence shows that upon HP the BG cells and GFP+ cells from the VMC reorganize, and that expression of GFP decays transient whereas expression of NeuN, Iba1 and nestin increases. No evidence of cell proliferation was detected. These changes may be associated to a metabolic response for neural protection.

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15. CONSUMPTION OF BEAN LEAVES (PHASEOLUS VULGARIS) OR READ QUINOA (CHENOPODIUM BERLANDIERI SPP. NUTTALLIIAE) TO PREVENT METABOLIC RISK

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Central obesity and insulin resistance are underlying factors in the development of metabolic syndrome; a healthy diet, physical activity and changes on lifestyle could be ways to prevent both. It is important to take advantage of unexploited species, bean leaves have high values of iron, which deficiency its related inflammation and development of chronic diseases and red quinoa is rich on protein, it could be used to weight loss therapy. The aim of the present study was to determine the effect consume 10% of bean leaves or red quinoa preventing metabolic risk. For 6 weeks, 48 male Wistar rats were fed with an obesogenic (fructose 20%, butter 20%, cholate 0.15%) or standard with/without 10% of bean leaves or red quinoa. Weight gain, food intake and serum levels of glucose, insulin, HOMA-IR (homeostatic model assessment), triglycerides, total cholesterol, cLDL (low density lipoprotein cholesterol), cVLDL (very low density lipoprotein cholesterol), chDL (high density lipoprotein), inflammatory cytokines (interleukin 6, tumor necrosis factor alpha, monocyte chemoattractant protein 1) and leptin were analyzed. The consumption of red quinoa or bean leaves do not suggest changes on weight gain neither food intake, but reduce serum levels of triglycerides 54%, total cholesterol 16%, cVLDL 57%, HOMA-IR 40% and improve chDL 30%. These outcomes show a protect effect versus the development of obesity, metabolic syndrome and insulin resistance and the possibility to promote the consumption of unexploited species.

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16. PACED MATING INCREASES THE EXPRESSION OF µ OPIOID RECEPTORS IN THE VENTROMEDIAL HYPOTHALAMUS

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Mating induces a positive affective state which is blocked by the systemic administration of naloxone, a specific opioid antagonist. Opioids are released in the medial preoptic area (mPOA) and other brain regions during sexual behavior and mu opioids receptors are activated in males that copulate until ejaculation. The aim of the present study was to determine if mating increases the expression of µ opioid receptor (MOR) in areas involved in the control of sexual behavior in male rats. We used ninety sexually experienced Wistar male rats that were randomly assigned to one of the following groups (n=10 each): a) Paced (P), males were allowed to mate, pacing the sexual interaction; b) Non Paced (NP), males were allowed to mate without pacing the sexual interaction; c) Control (C), males were able to hear, see and smell a sexually receptive female, but no physical contact was possible. Males were sacrificed by decapitation 4, 8 or 12 h after the behavioral tests. The mPOA, ventromedial hypothalamus (VMH), amygdala (AMY), olfactory bulbs (OB) and the cortex (CTX) as control were dissected. After RNA isolation and cDNA synthesis, expression of the MOR was determined by qPCR in duplicates. No significant differences were found among P, NP and C groups in the expression of MOR in the mPOA and the AMY independently of the time of sacrifice. In the VMH, the expression of MOR increased in the P compared to the C and NP groups at 4h. No significant differences were found in this area at 8 and 12h. In the CTX and OB, expression of the receptor was not detectable. Interestingly, we found that the expression of MOR varied at the different times of sacrifice. In conclusion, our results showed that the expression of MOR varied in the different brain areas depending on the time of the day. Independently of this variation, paced mating in males induced an increase in MOR in the ventromedial hypothalamus 4 h after mating, further supporting the contention that opioids are involved in the control of sexual behavior.

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17. EFFECT OF PROLACTIN ON CCL4-INDUCED CIRRHOSIS DEVELOPMENT

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Cirrhosis is a consequence of chronic liver damage of different etiologies. It is characterized by the accumulation of fibrous tissue with the consequent loss of functional hepatic area, a local and systemic inflammatory state and pathological angiogenesis occurring in the liver. Several authors have shown correlations between increased serum prolactin (PRL) and cirrhosis development and progression, but the specific role of PRL in the disease remains to be elucidated. PRL stimulates liver growth, promotes hepatocyte and cholangiocyte proliferation and neovascularization of the normal and regenerative adult liver, and modulates the liver immune response after partial hepatectomy. Moreover, PRL can be processed to vasoinhibins, a family of peptide with anti-angiogenic activity. We hypothesized that PRL might serve as a regenerative stimulus in the liver via stimulating liver cell proliferation and also via the generation of vasoinhibins as a mechanism to regulate the angiogenic response. Here we established a CCl4-induced cirrhosis animal model to determine whether PRL is involved in the development and progression of fibrosis.
We evaluated mortality and fibrosis development in wild type (Prlr+/+) and PRLR null mice (Prlr-/-) treated with 2 g/kg of CCl4 or vehicle ip twice a week for 4 weeks. We found an overall mortality of 4 and 3% in the Prlr+/+ and Prlr-/- vehicle-treated mice (1 of 25 and 1 of 29), respectively and of 52% and 37% in the Prlr+/+ and Prlr-/- CCl4 treated-animals (28 of 54 and 20 of 54), respectively. Liver histological evaluation showed induction of 20% mild and 10% moderated fibrosis in Prlr-/- vehicle-treated animals. All CCl4-treated mice showed fibrosis development of several stages ranging from mild fibrosis to cirrhosis. Higher prevalence of fibrosis was observed in CCl4-treated Prlr+/+ animals with the exception for the stage of cirrhosis that only occurred in Prlr-/- animals. The lack of cirrhotic Prlr+/+ animals may be explained by the higher mortality associated with the increased disease severity. Finally, higher liver expression of collagen was observed in all CCl4-treated animals assessed by qPCR. These results show that CCl4 treatment induces fibrosis in Prlr+/+ and Prlr-/- animals and suggests that PRL promotes the progression of the disease.

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18. REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION (rTMS) IN ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD): NEW TECHNIQUE FOR AN OLD CONDITION

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INTRODUCTION. The Attention-Deficit/Hyperactivity Disorder (ADHD) is a developmental condition characterized by the presence of inattention, hyperactivity and impulsivity. The ADHD first line treatment is the drug Methylphenidate (MTP). Nevertheless, a high rate of treatment resistance is presented in the ADHD, with failures to adequately reduce the symptoms as high as in 50% of patients. Repetitive Transcranial Magnetic Stimulation (rTMS) is a neuromodulatory technique, able of stimulate or inhibit the cerebral cortex depending on the stimulation frequency, at high frequency (> 5Hz) or low frequency (<1Hz), respectively.

OBJECTIVE. The present study seeks to investigate the benefits of the rTMS to decrease the clinical symptoms of ADHD.

METHOD. Participants were adolescent (14-17 years) outpatients with a primary diagnosis of ADHD and poor or no response to MTP. They received fifteen sessions of rTMS at a frequency of 5 Hz, applied over the frontal midline. The effect size (ES) of the rTMS therapy was analyzed, by calculating the Cohen’s d. This calculation was done separately for each clinimetric test: Questionnarie for screening Latin American schoolchildren and adolescents for ADHD (QLSA-ADHD), ADHD Rating Scale-IV (Du-Paul), Anxiety Auto report for Adolescents (AAA), Barratt impulsiveness scale (BIS). Cohen’s d was used to compare the mean score of each test before and after the 15 sessions of rTMS.

RESULTS: rTMS treatment diminished significantly ADHD symptoms in 3/5 patients evaluated by QLSA-ADHD and BIS, and in 4/5 patients using DU-PAUL and AAA.

CONCLUSION: The results of this study, analyzed by the calculation of Cohen’s d, suggest that high-frequency (5 Hz) rTMS applied over the frontal midline could be an effective treatment for ADHD symptoms.

19. PROGRESSIVE CHANGES IN THE EXPRESSION OF 5-HT7 SEROTONIN RECEPTOR IN PARAVENTRICULAR NUCLEUS OF HYPOTHALAMUS ARE RELATED TO DIFFERENCES IN SPONTANEOUS MOTOR BEHAVIOR IN A Rodent MODEL OF CHRONIC STRESS

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Stress is the physiological reaction that living organisms use to confront threatening situations, thus increasing the individuals’ opportunities to survive. In mammals, intimidating stimuli can be presented as single events called acute stress, that immediately triggers the activation of the sympathetic nervous system that results in epinephrine release by the adrenal medulla. However, hypothalamus-pituitary-adrenal (HPA) axis neuroendocrine response is activated as well. Activation of the HPA axis begins with the secretion of corticotropin releasing hormone (CRH) by parvocellular neurons of the hypothalamic paraventricular nucleus (PVN), which induce the release of adrenocorticotropic hormone (ACTH) by the anterior pituitary. ACTH, is transported through bloodstream to target its receptor in the adrenal cortex to synthesize and release cortisol, hormone that regulates the negative feedback of the HPA axis reestablishing homeostasis. PVN neurons receive direct serotonergic projections of raphe nuclei and express several serotonin (5HT) receptors as type 7 (5-HT7). It has been previously documented that the expression of 5-HT7 in PVN is modified after chronic stress exposure, suggesting a possible association between serotonergic system and HPA axis dysregulation, though the progression of these changes remain unknown. Therefore, the goal of this work was to explore changes in 5-HT7 receptor expression in PVN at 5, 10 and 14 of a chronic restriction stress protocol in rodents. Adult male Wistar rats (230-250 g, n = 32) were exposed to an unpredictable 20-minute daily episode of restriction stress or handling in previously established periods. At the end of the experiment spontaneous motor behavior was evaluated. Our results showed differences in 15-day spontaneous motor behavior of chronic stressed animals compared to 5 days of chronic stress or manipulation control. Our histological results showed a significant reduction in the number of 5-HT7 immunoreactive neurons in PVN in chronic stressed animals of 15 days compared to controls and with 5-day stressed rats.

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20. SYPHILITIC SPINAL CORD GUMMA ON HIV-INFECTED MALE PATIENT? CASE REPORT

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Introduction

Recently, rates of syphilis have increased among homosexual men, especially in human immunodeficiency virus (HIV)-infected patients. Several studies have postulated that Treponema pallidum (TP) in HIV-positive patients invades the central nervous system early in the course of infection and develop neurosyphilis (NS). The aim is to present a patient with syphilis with unusual clinical course.
Presentation of the case
A 33-year old male with HIV diagnosed 11 years ago and acquired immune deficiency syndrome was seen at the General Hospital of Querétaro, for treatment and follow up. This occasion presented at the emergency room with 2 months history of loss of muscle strength of the right pelvic limb, proximal to distal progression to paretic gait for a month; associated with weight loss and night fever. Before admission he stopped antiretroviral mediation for 8 months and his CD4+ count was low (plasma HIV RNA level of 250,000 mL-/copies and CD4+ cells: 1/μ). Abnormal laboratory test results (Table 1 and 2).

On arrival, symptomatology worsened and added loss of muscle strength of the contralateral limb and sphincter control. Examination, cognition, cranial nerves and vital signs were normal. Neurological examination revealed motor deficits at T4 with paraparesis, generalized hyperreflexia 3/4+, bilateral lower limb palsy, loss of superficial sensibility.

Cervical column magnetic resonance imaging (MRI) showed multi-nodular lesions in C2 and C6-7, thoracic spinal cord. VDRL® test in cerebrospinal fluid (CSF) was reactive and TP Antibodies test were positive.

Conclusions
SG is a granulomatous locally destructive lesion which usually occurs 3-12 years after primary syphilis. They occurred anywhere in the brain or spinal cord. Manifestations depend on the location.

The increased prevalence of NS in HIV-infection is 23.5% in HIV-positive patients with untreated syphilis, this contrast with 10% in HIV-negative patients. Aggressive presentation can occur with either high or low CD4+ counts. Positive CSF-VDRL result has highly sensitivity for diagnosis of NS. Measurement of CSF antibodies to syphilis are used to confirm NS, and absence to exclude NS; MRI is useful diagnosing brain and spinal cord involvement with NS. SG diagnosis is rare nowadays. Spinal cord compression for SG is an exceptional finding.

References

21. MICROGLIA ACTIVATION AND ABSENCE OF CX3CR1 INHIBIT INTERMITTENT-HYPOXIA-INDUCED RESPIRATORY GENERATOR PLASTICITY

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Sleep apneas are a common pathology of premature neonates and susceptible adults. This pathology produces intermittent hypoxia (IH), a phenomenon capable of inducing neuroinflammation and alterations in neural circuit function and their associated behaviors. One of the functions modulated by IH is breathing. After a short period of IH, breathing undergoes a plastic phenomenon called long-term facilitation (LTF), which consists of an increase in the amplitude and/or frequency of the respiratory efforts that is maintained during extended periods (tens of minutes), even after IH has ceased. Breathing is generated by the pre-Bötzinger complex (PBC), a circuit located in the brainstem. The PBC can be isolated in a brainstem slice and can generate a LTF when IH is applied in vitro. Interestingly, in vivo LTF is inhibited under peripheral pro-
inflammatory conditions. Considering that peripheral inflammation activates microglia in the central nervous system, in this work we aimed to characterize LTF induction in vitro and to evaluate whether microglia activation inhibits this plastic phenomenon.

Our results show that IH application to brainstem slices containing the PBC induces a LTF of respiratory rhythm generation, which is characterized by an increased in burst frequency. In vitro LTF is inhibited when microglia are activated either optogenetically or with the immunogen lipopolysaccharide. In vitro LTF is also inhibited when microglia lack CX3CR1, which is the microglial receptor for the chemokine fractalkine, whose absence leads to microglial activation. Surprisingly, microglial depletion also inhibits in vitro LTF. Our results indicate that microglia activation interferes with the plasticity of the respiratory rhythm generator in response to IH, but they also indicate that basal microglia activity is necessary for LTF to occur.

22. EPITHELIAL MESENCHYMAL TRANSITION AND MIGRATORY ABILITY IN OVARIAN CARCINOMA CELLS ARE REGULATED BY A2B ADENOSINE RECEPTOR

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Extracellular nucleotides are signaling elements present in the tumor microenvironment; in previous studies, we described that hydrolysis of extracellular ATP (exATP) by apyrase (Apy) inhibits migration and favors an epithelial phenotype in SKOV-3 ovarian cancer cells. A pharmacological characterization of this effect suggested that the reduced migration was consequence of extracellular adenosine (ADO) accumulation. However, the subtype of the purinergic receptor ADORA activated, and the molecular mechanism involved in this effect have not been explored. In this study, we evaluated the mechanism involved in the ADO action on migration and the epithelial or mesenchymal phenotype of SKOV-3 cells by identifying modified transcriptional patterns using gene ontology methods. In addition, migration and epithelial-mesenchymal transition (EMT) markers were evaluated in response to adenosinergic ligands in order to identify the receptor subtype involved in these actions. The transcriptional pattern was characterized by a microarray of 35K of the whole human genome in SKOV-3 cells stimulated with 100 µM ADO by 12 h. The treatment with ADO reduced the expression of WNT2, 6 and 10B and FGF18, whose signaling pathways are involved in EMT in ovarian cancer. Whereas increased the expression of ARPC4 and RAPGEF1 transcripts, which are associated with cytoskeleton rearrangement. In parallel, a microarray was made in SKOV-3 cells incubated with 10 U/mL Apy, to remove ex-ATP and promote the generation of ADO. This treatment decreased the expression of FGF4, WNT3 and RHOF while augmented PTK2 and CFL2. Interestingly, both treatments decreased RAC1, a small GTPase linked to migration in ovarian carcinoma cells while augmented ARHGAP4, this gene codifies for FilGAP, a GAP protein that inhibits Rac1. On the other hand, incubation with 10 µM BAY-606583, an ADORA2B agonist, inhibits SKOV-3 migration (40% and 38% under the basal migration at 8 and 12 h), while NECA, a non-selective ADORA agonist, induced relocation of E-cadherin suggesting the promotion of an epithelial phenotype. Taken together, our results indicate new elements of adenosinergic pathways that mediate cellular migration and these effects could be mediated by ADORA2B activation.

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23. ARITHMETIC PROCESSING IN CHILDREN WITH DYSCALCULIA. AN EVENT-RELATED POTENTIAL STUDY

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Dyscalculia (DYS) is a learning disorder that affects the ability to learn math. Among 5%-8% school-age children from different languages and cultures have DYS. We compared the arithmetic processing in two groups of between children 8-10 years old, one with dyscalculia (DYS-G; n = 30) and another with normal academic performance (NAP-G; n = 20). All children were right-handed, without neurological or psychiatric alterations. We recorded the electroencephalogram (EEG) during a sum verification task (eg., $2 + 4 = 5$) each trial corresponded to two operands of one-digit followed by a correct (condition 1) or incorrect (condition 2) outcome. We obtained the Event-Related Potentials (ERP) by averaging segments of 1000ms (200 pre-stimulus) synchronized with the result of the sum, considering separately each condition. Analysis of the electrophysiological response was carried out performing a 4-way ANOVA, but no significant differences between groups were found.

Therefore, a 3-way ANOVA was separately performed for each group to evaluate significant differences between conditions. In the 280-360ms window a N400-arithmetic effect (incorrect outcomes have higher amplitude than correct-outcomes) was observed in both groups: DYS-G presented a slightly more distributed topography than NAP-G; at 360-440ms this effect was observed only in DYS-G. In the 440-540ms window only NAP-G presented a LPC-effect (incorrect outcomes have higher amplitude than correct-outcomes) with disseminated topography, at 550-700ms NAP-G continued showing the effect at centro-parietal-temporal distribution whereas DYS-G had a wider distribution, and at 700-800ms only DYS-G showed this effect in centro-parietal-temporal regions.

In conclusion the DYS _G_ had the N400-arithmetic effect associated with arithmetic incongruity processing was less focused and had longer duration in NAP _G_, and the LPC effect associated to process of re-evaluating of the result was delayed in the DYS _G_ compare to the NAP _G_. These results suggest that children with dyscalculia use more immature and inefficient strategies than NAP _G_, which would explain their worse performance in arithmetic processing.

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24. CORRELATION BETWEEN THE BEHAVIORAL PERFORMANCE AND THE EVENT-RELATED RESPONSE TO ATTENTION IN INFANTS DURING THE FIRST YEAR OF LIFE. A PILOT STUDY

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Prematurity correlates with a higher incidence of Attention Deficit and Hyperactivity disorder (ADHD) in school-age children. This deficit is diagnosed after 6 years. Attention delay can be diagnosed in infants using general purpose tests that examine cognitive development. Diagnosing and treating early attention delays may contribute to prevent that an attention delay in infancy become a consolidated attention problem such as ADHD. At the Research Unit of Neurodevelopment, an Infant Scale of Selective Attention (in Spanish,
EEAS, Escala de Evaluación de la Atención Selectiva) was designed to diagnose attention delays during the first year of life, and standardized on healthy infants with no suspected neurological damage. The objective of this project is to study the concurrence of the results of this behavioral test and the results of the electrophysiological response of attention capture during the first year of life. Method: It was proposed to examine the correlation between the auditory attention behavioral response and the electrophysiological response (ERP, event related potentials) during processing of a passive listening two tone oddball paradigm that elicit capture of attention response in a group of asleep term and preterm infants at 3, 6, 8 and 1 year old. Preliminary results showed a positive correlation between the raw EEAS auditory attention scores and the P3a amplitude in the preterm infant group at 6 months of age (Spearman’s correlation coefficient 0.758, p <0.01, N = 8 in Cz) and at one year of age (Spearman’s correlation coefficient 0.667, p <0.05). These results strongly suggest that the attention deficits detected behaviorally had a neurophysiological base.

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A (Académicos)

25. NEUROFUNCTIONAL REHABILITATION IN THE RECOVERY OF TRAUMATIC SPINAL CORD INJURY

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One of the most common causes of disabilities worldwide which affect the young and adult population is Traumatic Spinal Cord Injury (TSCI), frequently associated with accidents. This damage to the spinal cord results in the loss of motor, sensory and autonomic functions below the location of the injury. This damage entails a significant loss of functionality as well as alterations in the biopsychosocial, economic and family interactions of those who suffer from it. The intensive neurorehabilitation is fundamental to achieve the restoration of mobility and recovery of functionality as much as possible. This study prospectively evaluated the efficacy of a neurofunctional rehabilitation program in patients with traumatic spinal cord injury in a period of six months of treatment describing the improvements achieved derived by a physiotherapeutic program. We studied seven patients with complete and incomplete TSCI with an evolution greater than six months of injury, initial and final assessments were performed using the ASIA scale and postural assessments. The program included exercises for trunk control, standing/orthostatic training, body weight supported treadmill locomotor training and static bicycle training. Most of the patients achieved a motor level activation in the lower extremities mainly in the flexor muscles of the hip (p=0.031), as well as a favorable and significant changes at the postural level and in the realization of the decubitus movements (p<0.05). The proposed neurofunctional rehabilitation program was effective in partially recovering the sensitive and motor skills of the treated subjects. Patients are encouraged to continue the program to avoid the loss of their achievements and to obtain further progress.
26. REORGANIZATION OF THE CORTICOSPINAL TRACT IN MALNOURISHED PREMATURE INFANTS TREATED WITH NEUROHABILITATION THERAPY


Introduction: Premature birth is a worldwide problem, is estimated that about 15 million of new-born at year are delivered before 37 weeks of gestation, from these more than one million die prematurely. Those who survive present greater risks of health problems, including motor and cognitive alterations; the rates of neurological sequelae can affect up to 40% of them. Prematurity and low-birth weight are usually together and related to a malnutrition condition, which in the first months of life affects brain growth and development. Optimization of early nutritional support improves neurodevelopment. Neurohabilitation treatment (NT) is an early therapeutic approach that seeks to prevent sequelae of brain injury in infants at risk of neurological damage.

Objective: The aim of the study is to describe the reorganization of the corticospinal tract as well as the psychomotor development of premature infants who received NT.

Methods: Six preterm infants were classified according to their monthly nutritional assessments in undernourished (n=3) and well nourished (n=3). Tractographies of the corticospinal tract were performed in both hemispheres upon admission to the protocol and after receiving NT (eight months), manually placing the regions of interest in the posterior limb of the internal capsule and in the midbrain.

Results: The analysis of the results (fractional anisotropy, apparent diffusion coefficient, radial and axial diffusion) shows that there was no difference (p> 0.05) between groups in their neurodevelopment (gross and fine motor, cognitive and language) assessments. This result may be interpreted in two possibilities; 1) Neurohabilitation treatment has been referred that improve neurodevelopment, and therefore it is possible that even the effects of malnutrition on the brain maybe blocked by it, 2) the time of the follow up is maybe too short to observe the effects of the nutritional status in MRI analysis and development behavior. It must be necessary to increase the sample and the time of follow up.

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27. HEART RATE VARIABILITY DURING NEUROHABILITATION MANEUVERS PERFORMANCE IN INFANTS WITH PERINATAL BRAIN INJURY RISK FACTORS


Heart rate variability (HRV) is used to analyze the oscillations between consecutive heart beats and the low (LF) and high frequency (HF) of its spectrum are considered as indicators of autonomic nervous system (ANS) activity. Neurohabilitation treatment has shown to be effective to prevent and reduce sequelae in
infants with a background of high neurological risk factors. However, in some cases, it is contraindicated for being an active therapy requires adequate maturation of the cardiovascular control system.

The objective of this project is to determine the effect of the neurohabilitation Katona procedure on HRV in infants with perinatal risk factors for brain injury. Twenty four infants were registered (41.66% female and 58.34% male, average age 8.34 ± 3.31 corrected weeks). For each infant two evaluations of HRV during the neurohabilitation were obtained: one at rest condition and other as continuous condition. Both records have three stages (baseline, activation, and recovery).

HRV indices show that in activation and recovery stages significant differences were found in the mean of heart rate (MEAN HR, $P \leq 0.0001$) by relating the level of neurological risk (high and low) and the indices of the HRV, significant values were obtained in the activation stage in the parameters (LF, $P \leq 0.010$ y HF, $P \leq 0.005$). These results suggest that the HRV is directly related to the intensity in which neurohabilitation is performed while the level of risk is related to the activity of the ANS.

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28. USE OF THE HYSTERECTOMY TECHNIQUE FOR THE PASSAGE OF TRANSGENIC LINES FROM THE CONVENTIONAL ANIMAL FACILITY TO THE UNITY OF TRANSGENIC MICE (UTM) AT THE INB

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In laboratory animals such as rodents, subclinical infestations may result in experiments with non-repeated results, which may be due to the fact that these animals encounter some type of pathogen that interferes with the test being performed. Although the placenta acts as an efficient filter that protects the fetuses during their development from the transmission of most bacterial, mycotic, viral and parasitic agents present in the infected mother, at the time of delivery all these infectious agents can be transmitted to their pups by direct contact with the vaginal canal and lactation. For elimination of this type of infectious agents within a colony, the technique of hysterectomy is used, which allows the elimination of this type of infectious agent from the fetus before its natural birth. The technique consists of sacrificing cervical traction of a female mouse with 18.5 days of gestation and removing the pregnant uterus, the mom is immersing in a solution of benzalkonium chloride 0.5% at 37°C, then set in dorsal position. The abdomen is covered with sterile fields that expose the midline for the incision, the obtained uterus with fetuses is placed in a box inside a laminar flow hood and passed through the transfer that communicates the conventional animal facility to the UTM, once inside the sterile area and under a laminar flow hood the fetuses are individually extracted to be dried and resuscitated with a light body massage, and collocated in a warm bed. Then they are placed inside a cage with a CD-1 female nurse one day after deliver and removing the original litter. For about 15 minutes, we observe the acceptance or rejection of the new litter. Currently, we have 75% effectiveness in the use of this technique, and we have successfully transferred 7 mouse lines.

We are grateful for the support of the workers of the Animal facility at the INB.
29. STANDARDIZATION OF THE PROCEDURE FOR RECONSTRUCTING THE NIGROSTRIATAL FIBERS

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Parkinson’s disease (PD) is a neurodegenerative disease characterized by reduced movement, tremor and rigidity. From a classical perspective, the characteristic motor symptoms of PD result from a dopamine deficiency in the nigrostriatal pathway. Tractography is a non-invasive technique that provide us data about neurodegeneration in PD through indirect measures. While this technique is unable to query molecular characteristics (e.g., dopamine concentration), it is able to resolve the microstructural characteristics of white matter bundles and therefore reveals axonal degeneration secondary to neuronal loss. However, few studies have attempted to reconstruct the nigrostriatal fibers because it entails many technical difficulties. The present work aims to address them in order to standardize a procedure to reconstruct these fibers in 22 subjects (8 control subjects and 14 PD patients). To achieve this goal, diffusion-weighted magnetic resonance images (dMRI) were acquired. Signals derived from dMRI were analyzed through constrained spherical deconvolution (CSD), which provided the basis for probabilistic tractography. Substantia nigra and striatum were identified and manually delimited as regions of interest. To reconstruct the nigrostriatal fibers, tractography was initiated by “seeding” at the level of substantia nigra. Streamlines propagated from this region according to the diffusion profiles derived from CSD under certain rules: streamlines had to reach the striatum; avoid the cerebellum and the contralateral hemisphere; and not go superior to the upper edge of the caudate nor distal to the lateral edge of the putamen. Currently, nigrostriatal fibers of 4 subjects have been reconstructed, but several strategies are still being tested to avoid the contamination of other fibers, one of the most common difficulties. In this sense, the nigrostriatal fibers are difficult to reconstruct because they involve anatomical structures that are challenging to delineate in brain images, and fibers are frequently contaminated with fibers belonging to other fascicles due to proximity in their trajectories.

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30. POSSIBLE ROLE OF NF-κB IN LIVER GLUCOSE METABOLISM

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Background. The nuclear factor kappa B (NF-κB) is a transcription factor that regulates transcription of genes involved in immune response, inflammation and cell proliferation. Recently, it has been observed that NF-κB is activated after the treatment with glucose and insulin in mononuclear cells in culture, therefore, it seems that this transcription factor participates in glucose handling. Since liver is one of the most important organs that regulates glucose metabolism, we studied the effect of a protocol of restricted feeding schedule (RFS) that induces metabolic adaptations in glucose and insulin and does not involved inflammation over nuclear translocation of NF-κB in liver. Objective. To analyze the possible association of the presence of NF-κB in nuclear fraction from rat liver with glucose and insulin levels induced by RFS. Methodology. Adult male Wistar rats were maintained in a 12:12 h light-dark cycle in a controlled temperature environment. Experimental groups: RFS-2, food access for 2h (from 12:00 to 14:00 h) and RFS-5, food access for 5h, AL group: ad libitum feeding, for 3 weeks. Subunit p65 of NF-κB was analyzed in nuclear fraction of liver by Western-blot. mRNA expression of gluconeogenic enzymes and IL-1β were analyzed by RT-qPCR. Glucose in blood were measured by glucometer and serum insulin by ELISA.
Results: The RFS-2 implied 30% caloric restriction, decreased body weight, and induced peaks of glucose and insulin in blood after the food access that coincided with a peak of p65, without an inflammatory state in terms of IL-1β. RFS-5 induced a moderate enhancement of glucose and insulin in blood after food. The highest level of gluconeogenic enzymes gene expression occurred at different times in RFS-2 and RFS-5. Nuclear level of p65 did not present significant differences in RFS-5 and RFS-2 before food access, while was higher in RFS-2 than RFS-5 after food access.

Conclusions. Our data show that activation of the subunit p65 of NF-κB in terms of nuclear translocation responds to a metabolic challenge such as RFS in absence of an inflammatory state. This results suggest that NF-κB could be activated in the liver in physiological conditions related to glucose handling.

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31. EFFECTS OF PAIR-BONDING ON CELL PROLIFERATION IN Microtus ochrogaster

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Microtus ochrogaster (prairie vole) is a rodent that establishes a solid social organization. These mammals establish a pair-bonding and both males and females display parental behaviors toward the pups and nestle cares. These complex behaviors could be associated with plastic neuronal changes. In our lab we are interested in studying the plastic changes associated with the formation of pair-bonding in adult voles.

The aim of this study is evaluate the effects of pair-bonding on cell proliferation in subventricular zone (SVZ) and rostral migratory stream (RMS) in male voles.

To achieve this goal, we obtain 21 adult males that were randomly distributed in three different groups: 1) Control: animals that were not exposure to female sensorial cues; 2) Exposed: male voles were exposed to a sexually receptive female but they had not physic contact, and 3) Pair-bonding: male rodents that mate. Behavioral test last 6 h. To identify potential new cells, animals were injected with the DNA synthesis marker BrdU during behavioral test. Animals were sacrificed 48 h latter and their brains were processed to immunohistochemistry assays.

We performed double-immunostaining for BrdU or endogenous cell proliferation marker Ki67, whereas to evaluate if the new cells express markers of immature neurons we used Doublecortin. We analyzed at least three sagittal slides per animal using confocal microscopy. To quantify the number of proliferating neuroblasts, we divided SVZ and RMS in three regions (ventral, anteromedial, dorsal; and anterior, media and posterior, respectively). Now, we are analyzing immunolabeling images from experimental animals using Image J software, and finally these data will be tested with static analysis.

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32. ACTIVE COMPOUNDS OBTAINED FROM THE ANEMONE Bartholomea annulata VENOM INHIBIT THE VOLTAGE-DEPENDENT SODIUM CURRENT IN NEURONS

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Many marine organisms synthesize secondary metabolites that, in addition to their biological functions, might also be useful as bioactive compounds with therapeutic or pharmacological purpose. An example of these animal species are the organisms that belong to Cnidaria phylum, such as the anemones, that present specialized organelles called nematocysts, which contain compounds with neurotoxic and cytolytic effects. Previous studies about active compounds, obtained from sea anemones venom, have shown effects on ion channels or membrane receptors in the vertebrate’s nervous system. Our work is focused on isolation and purification of active compounds contained in the venom of the anemone named Bartholomea annulata, in order to evaluate electrophysiologically their effects on voltage-dependent Na+ (Nav) channels. For this, a venom extract was obtained from the nematocysts content, and then it was partially purified by molecular exclusion chromatography. The crude extract (CE), and the fractions II and III (FII and FIII), were tested using the standard patch-clamp technique, for their effects on Nav channels, that were recorded in isolated cortical neurons from rat embryos, maintained in culture. Results showed that CE and FII contain active compounds that caused complete inhibition of the voltage-dependent Na+ response, in all the cells (n=14) tested, this effect was dose-dependent. Also, both CE and FII eliminated the action potential, confirming a main effect on Nav channels inhibition. In conclusion, an active compound(s) from the venom of B. annulata interacts with neuronal Nav channels, its inhibitory nature and potency, are not common features described for venoms from different anemones studied before; thus, it is expected that this compound is acting through a novel mechanism.

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33. ANALYSIS OF THE MUTATIONAL LOAD IN THE MITOCHONDRIAL GENOME OF HUMAN PLACENTA

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The mitochondrion is a citoplasmatic organelle whose main function is the production of energy in the cell by oxidative phosphorylation. The mitochondrion has its own genome; it is a circular DNA molecule that contains genes encoding proteins which are part of the oxidative phosphorylation complexes in addition to tRNA and rRNA genes. The mutation rate in the mitochondrial genome is higher than that of the nuclear genome and it may contain deletions, indels, base substitutions and insertions. Some of these mutations have been implicated in different diseases including neurodegenerative and neuromusculars disordes which in many cases have been associated with mitochondrial dysfunction.

Previous analysis of our laboratory have shown a high diversity of deletions of low frequency in dental pulp fibroblasts. We now propose to study the mutational load in the mitochondrial genome of human placenta as it will allow us to obtain larger amounts of mitochondrial DNA for a more precise analysis. This project will entail the development of a method to extract and isolate mitochondrial DNA from human placenta, as well the use of massive sequencing techniques and bioinformatics tools to quantitate all types of mutations mentioned above.
34. LEXICAL ACCESS IN THE TARGET AND NON-TARGET LANGUAGE: ELECTROPHYSIOLOGICAL EVIDENCE FROM SPANISH-ENGLISH BILINGUALS

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Rodríguez-Fornells et al. (2002) suggested that bilinguals can block lexical access to the non-target language. In their ERP study using dual choice go/no-go tasks they found a word frequency effect in the target but not in the non-target language. However, other ERP (e.g. Ng & Wicha, 2013) and behavioural (e.g. van Heuven, Dijkstra & Grainger, 1998) studies have found that lexical access occurs in both target and non-target languages, supporting the assumptions of the BIA+ model (Dijkstra & van Heuven, 2002). This model assumes that in bilinguals who learned the second language after childhood (late bilinguals), a nonselective activation of the first and second language codes and a temporal delayed activation of the second language representations relative to the first language codes occur. We investigated the time course of word frequency and lexicality effects in Spanish-English late bilinguals (n=19) using dual-choice go/no-go tasks. Each of the tasks included low and high frequency Spanish and English words, pseudo-words, and letter strings. One half of the items started with a vowel while the other half started with a consonant. Participants were required to only indicate whether words in the target language (which was either Spanish or English) started with a vowel or a consonant and to withhold responses to non-target language words, pseudo-words, and letter strings. ERPs revealed main effects of lexicality in non-target items from 400-600ms for Spanish and from 500-600ms for English words along the midline and at central brain regions. ERPs revealed also early (100-200ms) and late (500-700ms) word frequency effects for target and non-target words in both languages. Response times showed a similarly sized word frequency effect in Spanish (92 ms) and English (104 ms), but overall faster responses for Spanish than for English words. In line with the BIA+ model, these findings confirm delayed effects of lexicality and frequency in the second language irrespective of whether the second language is the target or non-target language.

35. EXPRESSION OF SYNAPTOPHYSIN IN MONOPARENTAL/BIPARENTAL PRAIRIE VOLES AFTER PAIR-BONDING FORMATION

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The prairie vole (Microtus ochrogaster) unlike mice and rats is characterized by lasting pair-bonding formation and biparental care (BP) towards the pups. Previous studies have demonstrated that the absence of the father (monoparental care, MP) can affect the development and adult social behavior of the pups. When MP pups reach adulthood, they have a reduced care towards their own pups, also both males and females take a longer time, to form pair-bonding. The physiological and plastic changes that may explain these behavioral differences are not well understood.

On the other hand, synaptophysin (SYP) is marker for synaptic plasticity. Previous studies have demonstrated that a reduction in parental care during the first stages of postnatal development decreases significantly the expression of SYP in rats. The aim of this study is to evaluate if the absence of paternal care reduces the expression of SYP as well as inhibiting pair-bonding formation. We use 6 mating couples that were divided in monoparental families
(MP, n=7), in which the males was removed at gestational day 18th, and biparental families (BP, n=5) in which the male remain with the female during all the experiment. At postnatal day 21 the pups were removed from the family cage and left undisturbed until they were 3 months old. For the partner preference test (PPT) both males and females were assigned to a sexual partner, not participating in the study, and let them cohabite and mate for 24hrs. The next day we performed the PPT to evaluate if they preferred their assigned partner (P) or a strange (S) prairie vole, 24 hours after the PPT the animals were sacrificed in order to recollect the brain. Accessory olfactory bulb and nucleus accumbens brain sections were processed by immunofluorescence to visualize SYP. Our preliminary results demonstrate that BP males show a preference towards their mate (p=0.068) whereas MP shows a preference towards the S (p=0.08). No difference where found either in MP females nor BP females (p=0.22, p=0.08 respectively). Currently we are performing the immunofluorescence and the densitometric analyze; we hypothesize that a low expression in SYP will explain the lack of pair-bonding formation in MP prairie voles.

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36. EVALUATION OF TEMPERAMENT TRAITS AND PARENTING STYLES ON EXTERNALIZING AND INTERNALIZING PROBLEMS ON CHILDREN WITH PERINATAL RISK FACTORS FOR BRAIN DAMAGE

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Introduction: It is well known that children with perinatal risks (i.e. low birth weight and short length of gestational age), have more possibilities to develop psychopathologies later on. Temperament traits (i.e. negative affectivity) and parenting styles (i.e. authoritarianism) have been reported to have an effect on externalizing and internalizing problems. Externalizing problems consists on attention problems and aggressive behaviors. Internalizing problems consists on negative behaviors such as depression, anxiety, somatic complaints and withdrawn. At the Neurodevelopment Research Unit, UNAM, several studies (e.g MRI, EEG, psychology assessments) and Katona’s treatment (neurohabilitation) are performed on children with risk factors for brain damage from two months to 8 years of age. The objective of this study is to evaluate the role of parenting styles and temperament traits of both children and parents on internalizing and externalizing problems on preschool years. Methods: Both primary caregivers of 39 children with ages between 3 and 5 years old (M = 3.80, SD =.83) participated in this study, 51.3 % were boys and 48.7% were girls. Both caregivers were asked to answer the following questionnaires: Child Behavior Check List (CBCL), Child Behavior Questionnaire (CBQ), Parent Authority Questionnaire (PAQ) and Adult Temperament Questionnaire (ATQ). Linear regression analysis was performed. Results: Adjusting for parenting styles as mediating variables, results showed that negative affect in children (β: 6.06, 95% CI: 1.41-10.86) and authoritarian mother (β: 0.43, 95% CI: 0.03- 0.82) were the main factors associated to internalizing problems. As for the externalizing problems, effortful control in mothers was the only factor that showed significant association (β: -4.99, 95% CI: -8.20- -1.75). Conclusion: These results do not support previous research reports on temperament traits and externalizing behaviors. However, longitudinal studies are needed to understand the development of emotional and behavior problems.

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37. DECODING ACROSS SENSES THE REPRESENTATIONS OF EVERYDAY OBJECTS FROM THE LATERAL OCCIPITAL COMPLEX

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Visual paradigms highlight the role of lateral occipital complex (LOC) in the representation of everyday categories, but these objects can be perceived by different senses. Our goal was to determine if it is possible to decode everyday object categories in LOC independently of the sensory system used. We used a multisensory paradigm in which we presented carrots, breads, apples and marshmallows in independent runs of visual, olfactory, gustatory and tactile modalities (8 runs for each sense, n = 10). Functional images were acquired on a 3-T Philips scanner (TR/TE = 2000/27 ms, 2 x 2 x 3.5 mm3 resolution). A multivoxel pattern analysis and full-brain searchlight were performed using a 5 voxel radius. The results show that the only region with predictions above chance (p < 0.05) for all senses was LOC, we also test others multimodal regions like prefrontal cortex and precuneus but without predictions above of chance to all senses. In conclusion, we found that LOC contains category-specific patterns of BOLD activity, suggesting that LOC encodes high-level characteristics of the stimulus independent of the sensory modality of presentation. Our results suggest that representations of everyday objects in the ventral visual pathway are not exclusively visual, rather are an integrative representation. However, at this point we do not know if LOC have an amodal or multimodal representation.

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38. NEONATAL VISUAL EVOKED POTENTIALS ARE MORE RELIABLE DURING ACTIVE SLEEP

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ABSTRACT: Because of their high prognostic value, Visual Evoked Potentials (VEPs) have often been studied in newborns to identify abnormal development of visual pathways; however, large variability has been reported. While it is well-known that the morphology and late components of evoked potentials change depending on wake-sleep stages in adults, there is uncertainty as to the effect of sleep stages on VEPs in neonates.

OBJECTIVE. To describe the characteristics of monocular VEPs in healthy full-term newborns during quiet sleep (QS) and active sleep (AS), determined by polysomnography (PSG). METHODS. VEPs were obtained by monocular light emitting diodes stimulation during AS and QS, identified by simultaneous PSG recording, in 20 healthy full-term newborns (gestational age 37-40 weeks) with normal birth weights and negative prenatal Doppler ultrasound studies. The replicability of VEPs and the latencies and amplitudes of N2, P2 and N3 components in AS and QS were compared. RESULTS. Although there were no significant
differences in VEP latencies and amplitudes between the two sleep stages, typical, symmetrical waveforms were obtained in all newborns in AS. In contrast, no VEPs could be identified clearly in 15% of the babies in QS. Replicability was significantly lower in QS, where higher averaging was required; correlation was significantly lower between the VEP blocks; and a higher number of babies needed more than two blocks.

CONCLUSIONS. Results show that recording neonatal VEPs is more reproducible and easier to obtain during AS. Systematic VEP recording during AS, and polysomnographic control to identify this stage, are highly recommended as methods that can increase the reliability of neonatal VEPs.

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39. TWO DISTINC FASTING PROTOCOLS MODULATE DIFFERENTIALLY β-CATENIN FORMS IN THE HEPATIC ACINUS OF RAT LIVER

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Biochemically, the functional unit of the liver (the hepatic acinus) is heterogeneous; that is reflected in the distinct hepatocyte enzymatic contents, which enable hepatocytes to specialize in particular metabolic pathways. This phenomena is known as metabolic zonation and it correlates with hepatocyte localization around some anatomical references within the acinus, fostering hepatocyte classification in pericentral (PC), intermediate (Iz) and periportal (PP) populations.

Metabolic zonation is mainly regulated by a transcriptional factor that promotes gluconeogenic and NH4+ detoxification responses, the β-catenin, which is regulated by phosphorylation at diverse serine residues to favor its degradation (serine 33) and/or its transcriptional enhancement (serine 675). Therefore, the aim of this project was to determine if the total and the β-catenin phosphorylated forms (pSer33 β-catenin and pSer675 β-catenin) were zonated into the hepatic acinus, and if 2 different fasting-refeeding cycles modalities (that increase gluconeogenic response) could modify β-catenin zonation. We divided male Wistar rats in the next groups: Ad libitum (AL), a daily restricted feeding (DRF) for 3 weeks, and an acute fasting (Fa) with a posterior refeeding of 2 h (Rf). Afterwards, liver tissue was processed at 11:00, 14:00 (schedules related with food access) and 02:00 h for a double immunohistochemistry of any of the β-catenin forms and the glutamine synthetase enzyme (GS) a marker of the PC zone of the hepatic acinus.

Results showed that all β-catenin forms in AL and DRF groups are zonated: total β-catenin and pSer675 β-catenin were located in the cytoplasm of PC hepatocytes, but in the cell membrane of the Iz to the PP hepatocytes. Meanwhile the pSer33 β-catenin was observed both in the cytoplasm and in the cell membrane of the PC hepatocytes. Fasting treatments did not modify β-catenin forms’ zonation, but they enriched pSer675 β-catenin and total β-catenin in the cell membrane of DRF group and the total β-catenin in the cell nucleus of the Fa group (detected by immunofluorescence and Western blot). We conclude that β-catenin forms differentially respond to fasting modality.

Nonetheless, their functions are segregated between the PC hepatocytes (transcriptional function) and PP hepatocytes (structural/reserve functions) into the hepatic acinus.
40. MILK PRL COUNTERACTS METABOLIC DISTURBANCES IN OFFSPRING, DERIVED FROM A MATERNAL HIGH FAT DIET DURING LACTATION

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Maternal overnutrition during lactation alters milk composition and leads to metabolic disturbances in the offspring. Maternal milk contains many hormones that regulate metabolism. Prolactin (PRL) is an important regulator of lactation; it promotes the initiation and maintenance of lactation, also stimulates milk production and regulates its composition. In adult rats, PRL is reduced in the circulation of obese animals and treatment with the hormone ameliorates insulin resistance (IR) in those animals, however little is known about the effects of PRL on the offspring metabolism during lactation. To evaluate this, we analyzed whether a high fat diet (HFD) in lactating rats reduces PRL levels in serum and milk, and if this diminution contributes to development of metabolic alterations in their offspring. We used lactating Wistar rats fed with control diet (CD) or HFD, treated or not with PRL delivered by subcutaneous osmotic mini pumps (HFD+PRL). On the other hand, offspring from HFD dams where treated orally with PRL (oPRL) or vehicle. We found that serum PRL levels were not reduced by HFD intake, whereas milk PRL levels and milk yield were reduced by this diet. On the other hand PRL treatment in dams fed with HFD, resulted in increased milk PRL and milk yield at early lactation. HFD intake only during lactation promoted morphological alterations in the mammary gland (MG); lower parenchymal area and increased adipose area, higher expression of inflammatory and involution genes, while lower expression of genes involved in protein synthesis, and reduced expression of the PRL receptor. Interestingly, HFD+PRL dams, showed normalized MG structure and function. Moreover, offspring from HFD lactating rats, exhibited increased body weight gain, higher adiposity in the visceral depot, elevated liver triglycerides (TAG) content, and developed hyperinsulinemia and IR. PRL treatment in HFD-fed dams or directly in their pups reduced metabolic disturbances in the offspring. In conclusion, maternal PRL acting in the mother and directly in the offspring has a key role in maintaining metabolic homeostasis in offspring during lactation, and PRL functions are impaired by maternal overnutrition during this critical period of development.

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41. PROLACTIN GENE TRANSFER BY ADENOASSOCIATED VIRUS TYPE 2 REVERSES BLOOD RETINAL BARRIER BREAKDOWN IN DIABETIC RATS

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The hormone prolactin (PRL) is enzymatically cleaved to vasoinhibins, a family of PRL fragments that inhibit diabetes-induced blood retinal barrier (BRB) breakdown (BRBB) by targeting both the inner (vascular endothelial cells) and the outer (retinal pigment epithelium) BRB components. Diabetes upregulates the activity of cathepsin D and matrix metalloproteases 2 and 9, which are proteases able to generate vasoinhibins from PRL. Here, we hypothesized that the intravitreal administration of an adeno-associated virus type 2 vector encoding PRL (AAV2 PRL) would reduce BRB breakdown in diabetic rats by acting as a
source of vasoinhibins. Rats were intravitreally injected with the AAV2 PRL vector before or after inducing diabetes with streptozotocin (STZ) for 4 to 6 weeks. The AAV2 PRL vector inhibited the diabetes-mediated breakdown of the BRB as evaluated by the Evans blue method when injected after, but not before, diabetes was induced. AAV2 PRL transgene expression was upregulated in the retinas of diabetic rats compared to non-diabetic controls. We conclude that the diabetic condition enhances the protective effect of the AAV2 PRL vector by favoring the retinal transduction of PRL and its conversion to vasoinhibins. In addition, we used retinal flat-mounts coupled to fluoroangiography and found that the AAV2 intravitreal transfer of PRL reduced retinal vessel abnormalities induced by the intravitreal delivery of vascular endothelial growth factor, the main factor causing microvascular retinal alterations in diabetes. Altogether, our findings suggest that AAV2 vectors encoding PRL may be desirable therapeutics to target diabetic retinopathy and diabetic macular edema.

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42. DENTATE GYRUS NEUROGENESIS INDUCED BY PAIR BONDING IN PRAIRIE VOLES

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Neurogenesis in the adult is a plastic neural process recapitulated in specific brain areas like the hippocampus dentate gyrus (DG). This process can be modulated by mating which favors pair bonding formation in Microtus ochrogaster. The plastic neuronal process involved in pair bonding are not fully known. In the present study, we evaluated if pair bonding formation induces neurogenesis in the DG. For this purpose we use 48 Microtus ochrogaster, 24 males and 24 females. Females were bilaterally ovariectomized and 2 weeks later treated with estradiol benzoate (0.5 µg/female daily for 4 days). Voles were aleatory assigned to one of the three following groups; 1) pair bonding, subjects that copulate with a conspecific; 2) exposure, those animals who were exposed to sensory signals of a conspecific and 3) control, subjects that were not exposed to sexual cues. During the behavioral tests, that lasted 6h, all animals received three intraperitoneal doses (100mg/kg) of the deoxyribonucleic acid synthesis marker 5-Bromo-2’-deoxyuridine (BrdU). Fifteen days later, all animals were sacrificed and perfused with PBS and 4% paraformaldehyde. Brains were sliced in the coronal plane at the level of the DG and processed for immunohistochemistry to detect BrdU positive cells. Our results show significant differences in the dorsal DG of pair bonding males vs male control group (p<0.05). There were no differences in this region in females. No differences were found in the ventral DG in females or males. In conclusion, pair bonding induces neurogenesis in males dorsal DG, but has no effect on females DG.

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(A)
43. ARM AND TRUNK BIOMECHANICAL PARALYMPICS SWIMMING MODEL: A CASE STUDY


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Biomechanics is a useful tool to study the kinematics and dynamics of the human body; it can be focused on sports to improve the performance of athletes. This research developed a biomechanical model to study the upper body range of movement of an athlete with congenital arthrogryposis who competed in the 50 meters backstroke in the Paralympic Games Rio 2016. Congenital multiple arthrogryposis is considered to be only a symptom of a group of disorders resulting in a concomitant, non-progressive, configuration of movement. This research designed a model that correlates muscle activity with anatomical angles of abduction/adduction, flexion/extension and internal/external rotation of the upper body (thorax, arm, forearm, lumbar spine, and thoracic spine) with the goal of evaluate range of movement.

The model consists of applying 19 markers at key points of the body. These markers created a vector system from which XYZ Euler angles can be determined: for the elbow relative to the shoulder and a second one relating the wrist to the elbow. This model includes 3 degrees of freedom rotation analysis of lumbar and thoracic spine that provides insightful information about the athlete’s motion. Additionally to the vector model, electromyography were taken in 16 bilateral muscles: Rectus Abdominis, Pectoralis Major, Pectoralis major, Deltoideus anterior, Trapezius transversalis, latissimus Dorsi and erector spinae longissimus leading to the correlation between the muscle activity and the anatomical angles.

In this case study, we detected the differences in abduction with 58 degrees in abduction and the left side with 53±1 Degrees in abduction with a higher electrical muscle activity in the right pectoralis Major, deltoïdes anterior trapezius transversals. This model allows to detect compensations in back, arms and trunk using a motion capture system like a 3D goniometer representing a resourceful biomechanical model.

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44. PERIPHERAL OR SPINAL ADMINISTRATION OF OXYTOCIN RELIEVES NEUROPATHIC PAIN INDUCED BY SPINAL NERVE LIGATION

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The neuropathic pain is caused by injury in the central or peripheral nervous system. The search of synthetic or natural ligands to treat neuropathic pain remains an important challenge. Recently, oxytocin (OT) has emerged as an interesting molecule in nociception modulation at central and peripheral levels, but no attempt has been done to systematically characterize the potential analgesic effect in neuropathic conditions. In male Wistar rats with spinal nerve ligature (SNL), the possible anti-nociceptive effect of OT administration; peripherally (31 µg/50 µl; administered ipsilateral to SNL) and at spinal level (10-5 M) was evaluated in several behavioral nociceptive tests (tactile allodynia, thermal and mechanical hyperalgesia and cold allodynia). Furthermore, an electrophysiological approach (unitary recordings) was realized to assess the effects of spinal administration of OT (10-5 M) on the activity of the spinal dorsal horn (SDH) wide dynamic range (WDR) neurons. Our results show that spinal or peripheral administration of OT diminished the painful behavior evaluated by Von Frey Filaments (tactile alldynia), Heargrave’s (thermal hyperalgesia)
and the Randall-Sellito tests. This anti-nociceptive effect was not observed in the acetone test (to measure cold allodynia). Moreover, spinal administration of OT markedly diminished the neuronal firing of the second order WDR neurons evoked by peripheral stimulation. This effect was correlated with a drop in the activity of primary afferent Aβ-, Aδ- and C-fibers. The above findings suggest that spinal or peripheral OT administration attenuate the painful behavior in a neuropathic pain model. Our findings supports the previous reports of OT use in analgesia.

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45. CRAWL’S BIOMECHANICAL ANALYSIS IN INFANTS WITH NEUROLOGICAL DAMAGE RISK FACTORS TREATED WITH NEUROHABILITATION. PILOT STUDY

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Background: The crawling biomechanical test provides a descriptive, detailed quantifiable analysis of movement patterns. Crawling is one of the gross motor development milestones considered as an important locomotion system for the infant’s neurological development. Neurohabilitation is an early diagnostic and therapeutic method used as a tool for diminish posible brain injury sequelae in neonates and infants with neurological damage risk.

Objective: To describe crawl’s biomechanics in infants with neurological damage risk factors treated with neurohabilitation.

Methodology: cross-sectional descriptive study. A crawling biomechanical analysis was performed in four infants with neurological damage risk intervened with neurohabilitation by using an optical 12 infrared camera system, recording was taken in Smart Capture, marker tracking in Smart Tracker and analysis in Smart Analyzer. The arms cycle was defined from hands clash and leg cycle in maximun flexion. Central tendency measurements were obtained as well as spatiotemporal variables.

Results: Right Thoracic Member work percent (Me: 24.25 ±8.007%), lower than left TM (Me: 35.02 ±11.82%). During the rest period percentages it is notable that the values obtained from the right and left TM are very similar. (Right Me:69.74 ±8.95%, Left Me: 69.28 ±9.90%). The right pelvic limb flexion period percent (Me: 34.483 ±13.52%) was lower than left one (Me: 43.29±11.67%). While the pelvic limb extension period percent was greater in the right (Me: 62.06 ±13.52%) than the result found in the left one. (Me: 56.70 ± 11.67%). The average found in the crawling speed was 0.229 ± 0.32 m/s.

Conclusion: It can be observed that the studied infants submit different parameters between hemibodies in percentage work and rest period, although the difference is minimun, this parameter should be kept under surveillance to identify if arises any important irregularity of the movement pattern.

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46. SENSING THE RHYTHM: PERIODIC AND APERIODIC STIMULI IN TOUCH, VISION, AND HEARING

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Sensibility to discriminate between regularly repeating events and others with unpredictable variations along its iterations is related with the certainty and success to anticipate their future occurrences. To behave optimally in dynamic environments, the organisms may require using one of two different strategies: accumulation-to-bound
or great-difference-detection. Although the accumulative models have been used to explain this type of perceptual decisions, it remains unclear the specific decision rule used to detect fine and randomly introduced time variations on sequentially displayed stimuli. Additionally, time perception literature has largely compared performance between auditory and visual systems, but less attention has been given to another fast change detector: the tactile modality. To account these issues, we design a psychophysical irregularity detection task to be performed by humans. Within each trial, participants decided -as fast as possible- if the current train of pulses (auditory, tactile, or visual) occurred at regular or irregular pace. Results suggest that tactile pulses were discriminated with higher sensibility than visual ones, although the auditory system seems to have the best discriminative performance. Response times seem to be ordered by the speed of change and magnitude of noise that characterize the train of pulses. Taken together both results give information about the implicated mechanism and decision rules to process changing sequences over time.

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47. LEVELS OF INDIRECT BILIRUBIN IN CHILDREN AT RISK OF BRAIN DAMAGE: STRUCTURAL AND FUNCTIONAL IMPLICATIONS

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Background. Kernícterus is a serious entity due to the excess of indirect bilirubin (IB) acting on the nervous system of the newborn, where the motor problems stand out. The term “Bilirubin-induced neurological disorder” is defined by a constellation of “subtle neurological developmental disabilities” without the classic Kernicterus characteristics.

Objective. To determine the structural and functional repercussions of IB levels in children at risk for brain damage.

Participants. 19 children with IB values of 2.1-5.1 mg/dL (mean=4.1, SD=0.99) (Group 1=G1) and 24 children with BI between 20-23.4 mg/dL (mean =21.53, SD=1.3) (Group 2=G2).

Methods. Data on IB levels, risk factors for brain damage (RFBD), magnetic resonance imaging (MRI) and electroencephalogram (EEG) data were taken from the records of each child attending the protocol of the Unit of Research in Neurodevelopment (URN) and the databases of the URN. Results. RFBDs prevalent in the G1, without considering hyperbilirubinemia, were prematurity (63.2%), sepsis (47.4%), asphyxia (36.8%) and urinary tract infections in pregnancy (31.6%); while in G2 they were: prematurity (29.2%), asphyxia (41.7%), urinary tract infections in pregnancy (29.2%) and threatened abortion (20.8%). Although MRI clinical reports showed a predominance of abnormal results in both groups, when the norms of corpus callosum volumes calculated in the URN were applied, normal volumes predominated but were not found in volumes of the lateral ventricles where G1 showed 75% of abnormal volumes compared to 46% in G2 (X²= 2.16, p≤0.14). From the total of EEGs performed to these children, there were dominance of normal in G1 and abnormal in G2 (X² = 20.18, p≤0.0001), including epileptiform activity.

Conclusions. Excessive IB may be an important factor to generate abnormalities more detectable with the EEG than with MRI.

48. IDENTIFICATION, BY RT-PCR, OF O-CONOTOXINS OF THE MARINE SNAIL Conus princeps AND PREDICTION OF THEIR MOLECULAR TARGETS

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Marine snails belonging to the genus Conus (~700 species) produce venoms for prey capture as well as defensive and competitive interactions. The venom of each species contains 50-200 distinct peptides (“conotoxins”), typically composed of 7-40 amino acid residues, including 0-5 disulfide bonds and diverse posttranslational modifications. Conotoxins can bind with high affinity and specificity to voltage- and ligand-gated ion channels, G protein-coupled receptors, or neurotransmitter transporters, leading to their use for research and clinical applications. Conotoxins are classified into gene superfamilies according to the sequence of the signal peptide of their precursors, and into pharmacological families based on their molecular targets.

The objective of this work is the identification of precursors of O-conotoxins from the vermivorous species Conus princeps from the Mexican Pacific coast, and the prediction of the probable molecular targets of the putative mature toxins.

Precursors were identified by RT-PCR, cloning, and sequencing, employing a forward primer based on the 5'-untranslated region and signal peptide, and a reverse primer based on the 3'-untranslated region of O-conotoxin precursors. Mature toxins were predicted by the ConoPrec tool of the ConoServer database. Tentative identification of the molecular targets was based on protein BLAST similarity searches, and analysis by the iCTX-Type online predictor.

Fifty-six clones were obtained and 21 of them were sequenced. Seven distinct precursors were identified and they encode seven different mature toxins belonging to the O1 gene superfamily. The BLAST searches and iCTX-Type predictions suggest that one of these toxins targets voltage-gated Ca+2 channels, whereas the others target Na+ or Ca2+ channels.

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49. LEFT-RIGHT ASYMMETRY IN GENE EXPRESSION IN THE MOUSE EMBRYONIC TELENCEPHALON

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Structural and functional Left-Right asymmetry occurs in vertebrates in several internal organs including the brain. Brain asymmetry and laterality have been observed in fishes, birds and mammals. In mammalian embryos, the specification of Left-Right asymmetry is initiated by ciliary motion at the Hensen’s node causing a vectorial flow of extracellular fluid and by releasing morphogenic signals that activate the Nodal cascade in the left Lateral Plate Mesoderm (LPM). Our hypothesis is that brain asymmetry in the mouse embryo begins in early stages of telencephalic development, that it is related to laterality, and that it is manifested in the asymmetric expression of genes associated with telencephalic regionalization and morphogenesis.
To identify genes with asymmetric expression in the embryonic mouse telencephalon we analyzed the transcriptome of the left (LV) and right telencephalic vesicles (RV) of E10.5 CD1 mouse embryos with the Illumina HiSeq2000 platform for paired reads by bioinformatic algorithms, statistical analysis of a negative binomial regression model and methods with edgeR. We detected 529 genes with increased expression in the RV and 368 genes with increased expression in the LV. Only 31 genes were expressed exclusively in the RV and 5 genes in LV. Most of the genes identified have been associated to embryogenesis, development of the nervous system or are non coding RNAs. The genes Kdm5d, Eif2s3y, Uty and Ddx3y had the highest asymmetry and were expressed predominantly on the RV. These four genes are located in the same region in the Y chromosome and are known to display sexual dimorphism. Other genes had with unique expression in RV such as Sufu and Fezf2; whereas Prkag2os2 and Fam166a were expressed in LV. The asymmetric expression of these genes is being confirmed by ISH and RT-qPCR.

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50. COGNITIVE MOTOR IMPAIRMENT UNDER A HIGH SUCROSE DIET

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Excessive consumption of sucrose has been related to metabolic disturbances such as type II diabetes mellitus, metabolic syndrome, and fatty liver disease, among others. Furthermore, it has been proposed that a high carbohydrate diet contributes to cognitive decline (Yaffe et al., 2004). Therefore, it is important to establish a relationship between metabolic disorders under a high sucrose diet (HSD) and its impact on the central nervous system. There is evidence that a HSD is associated with cognitive impairment (Soares et al., 2013) in hippocampal-dependent tasks. However, it has been scarcely investigated the impact of a HSD on the motor learning, particularly on a striatum body-dependent task (Willuhn & Steiner, 2009). Motor learning is a process associated with the ability to improve motor skills through practice (Cano de la Cuerda et al., 2015). The aim of this work was to identify changes in a motor skill in rats under a high sucrose diet. Forty male Wistar rats were used, grouped by the time of treatment (twenty and forty weeks). We employed the accelerating rotarod task for assessing the motor learning along with metabolic measurements. Treated rats exhibited a diminished latency to fall at forty weeks compared to control (31.3 ± 3.3 s vs. 50.2 ± 6.8 s; p<0.05) in the absence of significant changes in body weight. Furthermore, there were alterations in plasmatic triglyceride levels at twenty and forty weeks. On the other hand, the plasmatic insulin levels and body fat showed changes at twenty weeks. In conclusion, a high sucrose diet is associated with motor learning impairments in rats, concomitantly with metabolic alterations at twenty and forty weeks.

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51. INVOLVEMENT OF STRIATAL GLUCOCORTICOIDs IN EXINCTION OF A HABIT BEHAVIOR

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Glucocorticoids, such as corticosterone (CORT) in rodents, are important modulators of memory processes. In the case of extinction, a process by which behavior diminishes when the unconditioned or reinforcing stimulus is no longer present, systemic and intra-amygdala administration of CORT facilitates extinction of classical conditioning. It is not known if a similar effect is produced in the case of operant conditioning in this or in other cerebral structure. Stimulus-response associations, skills, and habits are acquired through operant conditioning procedures. The dorsolateral striatum (DLS) is importantly involved in acquisition, maintenance and extinction of these types of behavior. Therefore, we decided to investigate whether administration of CORT into DLS could facilitate extinction of habit behavior. To study this issue male Wistar rats were trained in a DLS-dependent habit task using the Tolman maze. Once this habit behavior had been acquired, two extinction sessions were given, where the latencies to enter were the reward was and the number of perseverative trials were measured. Five min before the first extinction session CORT (10, 20, or 30 ng/0.5 μl) or vehicle were bilaterally administered to the DLS. The second extinction session took place 24 h after the first one. No significant differences among the groups were found regarding the number of conditioned responses in either session; however, the latencies were significantly higher in the 10 ng-CORT group only on the first extinction session. The higher latencies displayed by the 10 ng-CORT group suggest that CORT in DLS affects motor performance; it has been reported that high latencies are indicative of extinction in this type of learning paradigm.

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**52. SIMULTANEOUS EEG-FMRI RECORDING**

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**Introduction**: Concurrent Electroencephalography and functional Magnetic Resonance Imaging (EEG-fMRI) is a multimodal neuroimaging technique that intends to assess the electrophysiological and hemodynamic correlates of spontaneous and evoked brain activity simultaneously. Several issues must be considered to perform EEG-fMRI successfully and safely. Each technique suffers from artifacts introduced by their counterpart (gradient and ballistocardiographic artifacts in the EEG and image degradation in MRI). Safety concerns are related to the utilization of EEG recording systems inside the MR environment. Technical developments to solve these issues include hardware modifications of the EEG equipment and specialized software tools employed to reduce the artifacts introduced in the EEG.

**Method**: As the Instituto de Neurobiología UNAM recently acquired an MR compatible EEG recording system, it is necessary to develop a standardized procedure that ensures safety and high quality of both signals during EEG-fMRI, using the two 3.0 T MR equipments. EEG and fMRI will be recorded independently and simultaneously (EEG-fMRI), first in a pilot study and then in a group of subjects. Signal quality will be compared between conditions: for EEG spectral power, topographical maps of traditional bands and EEG reactivity (eyes opening and closure); for MRI the signal to noise ratio of the images, the resting state networks and hemodynamic activation during a simple motor task.

**Results**: The pilot study showed how EEG and fMRI data are affected when performing simultaneous recordings. For EEG, the hardware and software tools seem to accurately correct the gradient artifact, whereas the ballistocardiographic artifact removal represents a more challenging task. In the case of MRI, structural images show susceptibility artifacts, however, these artifacts do not seem to compromise brain image. Resting state networks obtained from functional data during EEG-fMRI show high similarity to those reported in literature.

**Conclusion**: Further work is needed to ensure high EEG and fMRI data quality obtained during simultaneous recordings. Once this is achieved, it will be confirmed in a group of subjects. The next step will be to explore the diverse integrative analyses approaches in order to benefit from the advantages provided by simultaneous EEG-fMRI.

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53. INTERACTIONS OF BERGMANN GLIA WITH CELLS OF THE SUBEPENDYMAL ZONE OF THE ROOF OF THE FOURTH VENTRICLE

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The Bergman Glial (BG) cells of cerebellum have an important role during early development, providing a structural scaffold for granular cells migration; in the adult they are required for fine motor control coordination. In appearance, BG cells are homogenously distributed in the ten lobes that form the cerebellum (lobes I to X); however, recent studies in our lab disclosed that BG of the lobes that form the roof of the fourth ventricle, that is lobes I and X, can be classified in three populations according to their end-feet contacts. The organization of this area is very peculiar since it is in close communication with the cerebrospinal fluid of the ventricle and novel paths of communication may be involved. Thus, the aim of this project was to characterize the ultrastructure of the interaction between BG end-feet and cells from subependymal zone.

Cerebella from C57 mice were processed for transmition electron microscopy (TEM). The observations were limited to the roof of the fourth ventricle that is formed by the lobes I and X of cerebellum. It was found that BG end-feet of this area differ in several characteristics from BG end-feet contacting pia. In the subventricular zone, BG end-feet do not contact a basal lamina; in comparison to BG from other lobes these show numerous organelles, and electro dense cytoplasm. Furthermore, BG end-feet contact with ependymal glial cells and a type of cells that are in contact with blood vessels and distributed along the roof of the fourth ventricle, these cells show electro dense cytoplasm and divide the molecular cell layer from subependymal zone.

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54. NEURONAL CONNECTION BETWEEN THE PARAVENTRICULAR NUCLEUS OF HYPOTHALAMUS AND ROSTRAL AGRANULAR INSULAR CORTEX AND ITS ROLE IN NOCICEPTION

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Pain is a complex process that requires the integration of information at peripheral, spinal and supraspinal levels. On supraspinal level, rostral agranular insular cortex (RAIC) is believed to be an integrative structure in the process of nociception for its connection with medial thalamic nuclei, limbic system and the descending modulatory system of nociception. Since the electrical stimulation of the paraventricular nucleus of hypothalamus (PVN) induces antinociception, this nucleus seems to be a relevant structure in pain processing. Certainly a direct oxytocinergic connections with the spinal cord acts as a part of the descending modulatory system of nociception, besides other connections with Raphe Magnus (RM) and Locus Ceruleous (LC). In this study, we investigate a possible direct neuronal connection between PVN and RAIC which could be important for pain processing and modulation. In male Wistar rats (280-310g), 20 nl of a retrograde tracer Flouro-Gold (FG) was injected into RAIC, subsequently analyses of FG +ve cells in PVN was performed. Results point out the presence of FG +ve cells in PVN mainly in the medial part in close contact with the wall of the 3rd ventricle. Some scattered cells along PVN were FG +ve, no clusters were found. Furthermore, we carried out an immune-florescent study of FG +ve floating slides of PVN using oxytocin (OT) antibodies “primary antibody: anti-OT 1:250 anti-mouse; secondary antibody: goat anti-mouse 1:300”. Some FG +ve cells coincide with OT marked cells or show a close relation with them, however, also...
some cells showed no relation with OT neurons. Taken together, our results do not only show that a direct connection between PVN and RAIC exists, but also OT might have a role in this connection. Nevertheless, further studies will be done to figure out the role of such a connection in the nociception process and modulation.

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55. OXYTOCIN MODULATES NOCICEPTION AT THE LEVEL OF THE TRIGEMINOCERVICAL COMPLEX THROUGH OXYTOCIN RECEPTORS BUT NOT V1a

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Migraine is a disabling, neurovascular headache disorder. Briefly, migraine pathophysiology involves abnormal activation of trigeminocervical complex (TCC) neurons. Recently, it has been suggested that oxytocin (OT) is involved in pain modulation at the level of the spinal dorsal horn (SDH). At this level, oxytocin (OTR) or V1a vasopressin receptors (V1aR) seem to play a key role in nociception process, but their antinociceptive effect at the TCC level remains unknown. The present study aims to establish the effect of spinal OT (and receptor involved, OTR or V1aR) on TCC neuronal firing evoked by periorbital (first branch of trigeminal nerve) electric nociceptive stimulation and the receptor involved in this effect. In anesthetized male Wistar (280-320 g) rats we performed unitary extracellular recordings of wide dynamic range (WDR) neurons of TCC. The nociceptive neuronal responses were evoked by 20 electrical stimuli in the periorbital area (1ms, 0.5Hz). The neuronal activity was analyzed with post-stimulus time histograms that allowed to characterize the WDR neuronal activity by their response latency: A-delta fibers (3-30ms) and C-fibers (25-80ms). The antinociceptive effect was evaluated after spinal administration of three different doses of OT (10^-4M, 10^-5M, 10^-6M). We found that OT is able to reduce the TCC neuronal firing in response to periorbital-evoked nociceptive trigeminal activation. Certainly 10^-4M OT dose presented the most significant antinociceptive effect. Furthermore, using highly selective and specific OTR and V1aR antagonists we found that the receptor involved in the OT-induced antinociception correlate with the spinal activation of OTR rather than V1aR. Indeed, we pretreated the TCC with a selective OTR antagonist L-368,899 (10^-4M) and found a complete blockade of the action of OT (10^-4M) whereas (on another set of experiments) SR-49059 (10^-4M; V1aR antagonist) did not have any effect on the OT-induced antinociception. Taken together, our study demonstrates that OTR activation by OT on the TCC level is able to inhibit the nociceptive input from the first branch of trigeminal nerve. These results point out a new potential target for migraine treatment.

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56. EXPRESSION OF MGLUR3 IN LIVER PATHOLOGIES AND ITS RELATIONSHIP WITH INFLAMMATION

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Abstract

BACKGROUND: The glutamatergic system has been well studied in the central nervous system (CNS) but it is not clear its role in cellular processes in peripheral organs. In subjects with liver pathologies, serum
and extracellular levels of glutamate are increased compared with healthy controls. Furthermore, it has been reported that metabotropic glutamate receptor 3 (mGluR3) expression is increased in macrophages of fibrotic livers. Until now, it is not known what are the implications of both, mGluR3 elevation and higher concentrations of glutamate in hepatic inflammatory pathologies. In CNS, mGluR3 is downregulated in response to an inflammatory environment, so we hypothesized that mGluR3 could participate also in inflammatory liver pathologies. AIM: To investigate the possible association of mGluR3 expression with inflammation in liver pathologies.

**METHODOLOGY:** Male Wistar rats received a dose of 50 mg/kg of the hepatotoxic agent diethylnitrosamine (DEN) by intraperitoneal injection weekly during 8, 12, and 18 weeks to induce fibrosis, cirrhosis and hepatocarcinoma, respectively. Controls received the same volume of saline solution. To evaluate liver function integrity serum levels of transaminases were measured by spectrophotometric assays. Gene expression and protein levels were evaluated by RT-qPCR and Western Blot, respectively. Sequence of RT-qPCR products was determined by Sanger method.

**RESULTS:** Bioinformatic analysis showed that the DNA sequence of the amplicon of mGluR3 obtained from liver samples had 98% of identity to gen bank sequence. Gene expression of pro-inflammatory markers increased through disease progression. mGluR3 gene expression was reduced in all pathological conditions compared with healthy livers; however, mGluR3 protein expression did not have changes during the progression of the inflammatory states.

**CONCLUSIONS:** The inverse relation of mGluR3 liver expression with inflammatory conditions suggest that this receptor is down regulated by the enhancement of inflammatory factors. A high identity of cDNA sequence and the recognition by a specific antibody, indicates that the mGluR3 in liver is identical to that in SCN. It is important to know the biological significance of downregulation of mGluR3 to elucidate its role in liver pathophysiology.

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**57. CEREBELLAR GRAY MATTER VOLUME IS DIFFERENTIALLY AFFECTED BY AGE IN HEAVY MARIJUANA USERS**

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Cerebellum has a fundamental and largely recognized role in achieving motor dexterity, nonetheless, it also participates in language production, time perception, rhythm production, inhibition, attention, associative memory and emotions. CB1 receptors, one of the binding sites for cannabinoids, is highly expressed in the cerebellum, making it vulnerable to the potential longterm effects of marijuana consumption. Here, we have explored the gray matter of cerebellar cortex and its relation to marijuana consumption. Participants included 50 heavy marijuana users (at least 16 joints per month in the year prior to imaging) and 48 non-consuming controls. High resolution T1 weighted images were obtained with a turbo field echo imaging in a 3T MR scanner, images were anonymized and submitted to volBrain in order to obtain detailed cerebellum segmentation into 26 regions, with corresponding measures of gray matter volume. The results showed no significant differences in age nor sex proportions, however, a significant interaction effect between group and age was evident for bilateral Lobules IX. The controls showed decreased gray matter volume with age,
and contrasting developmental trajectory for heavy marijuana users. We appreciate the technical assistance of E. Pasaye-Alcaraz, L. Gonzalez-Santos and Ortiz-Retana J. We also appreciate the support of CONACYT 247428 and PAPIIT 204217.

58. IDENTIFICATION IN MALE RATS, BY MANGANESE ENHANCED MAGNETIC RESONANCE, OF THE NEURAL CIRCUITS CONTROLLING SEXUALLY MOTIVATED BEHAVIORS

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Sexual behavior is a motivated behavior, which is of paramount importance for the survival of many species. Several research groups have identified, using different techniques, the brain structures involved in the control of sexual behavior which include: the accessory olfactory bulb, the bed nucleus of the stria terminalis, the medial amygdala and the preoptic area of the anterior hypothalamus, (De Olmos et al., 1978, Scalia, Winanns., 1975).

Two motivated behavior which are crucial for the expression of sexual behavior are sexual incentive motivation and partner preference. The possible circuits controlling these behaviors have not been studied. In the sexual motivation incentive test, where no physical contact is possible, the time and frequency of visits to the incentive zone of a sexually experienced male (SE) or a sexually receptive female (RF) are measured. In the partner preference test the subjects can interact with the stimulus animals quantifying the sexual interaction and the time spent in each compartment. So the aim of this project is to determine by manganese enhance magnetic resonance imaging (MEMRI) the different neural circuits, activated in partner preference and sexual incentive motivation. The use of MEMRI allows mapping the brain of the animal in vivo where manganese ions (Mn2+) pass through the blood brain barrier and can enter into excited cells via voltage-gated calcium channels identifying brain regions activated by a particular behavior (Takeda et al., 2003). In the present experiments, MnCl2 (16 mg/kg) was administered 24 h before the behavioral tests and immediately thereafter the subjects were placed in a Bruker 7T MR scanner. Our preliminary results show that manganese at 16 mg/kg does not produced unspecific effects evaluated by the use of a running wheel and a rota-road test. Sexual behavior was not affected by the administration of manganese at 16 mg/kg. With this dose, we obtained a good contrast for MRI analysis. We are now analyzing the images to determine the circuit activated after sexual behavior, partner preference and sexual incentive motivation.

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59. MACHINE LEARNING AND SEMANTICS: DIFFERENCES AMONG MOTOR AND MENTAL VERBS

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The meaning of language appears to be represented in the brain, and the regions involved are known as the semantic system (Huth et al., 2016). Lexical categories include semantic knowledge. Thus, within the lexical category of verbs, those that describe motor actions, would be expected to be differentially mapped with respect to those that do not describe motor actions (e.g. mental verbs). Yet, little is known about the dimensions that characterize different classes of verbs (motor vs. mental). The present study addressed
this issue by investigating how are motor verbs (e.g. run), and non-motor or mental verbs (e.g. think), rated in five domains by healthy participants. Recently, it has been suggested that machine learning techniques can help elucidate the role of cognitive factors as predictors of a variable of interest. In this study, we used Regularized Linear Logistic Regression (glmnet) and Training of Neural Networks (neuralnet) to optimize the prediction of the verb class, and to identify which dimensions were relevant predictors. In order to do this, 32 participants, native speakers of Spanish, read motor-verbs (n = 149) and mental-verbs (n = 139), and rated each one on five dimensions: motor/mental-relatedness, concreteness-abstraction, imageability (the ease/difficulty with which words arouse a sensory experience; Paivio et al., 1968), emotional valence, and arousal. The psycholinguistic properties of the verb classes were obtained from the ADESSE database, and stimuli were matched in terms of length and frequency of use using the Sketch-Engine and LEXMEX corpus. According to our hypothesis, significant differences between verb classes were found on four of the five dimensions. Both machine learning analyses revealed that a combination of imageability, motor-mental and concrete-abstract dimensions predicted the semantic class of verbs with an accuracy of 0.98, and a kappa of 0.96. Emotional valence and arousal did not distinguish between verb classes. Our results suggest that if semantics drive brain activation topographies, verbs that differ in terms of motoricity, imageability, and concreteness, should show a differential mapping. This approach has potential to identify patterns of semantic representations for future neuroimaging or behavioral studies.

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60. NEURONAL POPULATIONS OF THE SUBVENTRICULAR ZONE FROM MOUSE CEREBELLUM

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The cerebellum (Cb) is the region of the brain in which afferent and efferent stimulus are integrated, to be later processed and give rise to orchestrated responses involved in motor coordination, motor learning, and emotional-cognitive processes. Although the cell organization of the ten lobes of cerebellum (I to X) is quite uniform, recent studies demonstrated a non-conventional cellular diversity in the subventricular zone (SVZ) of the lobes I and X. This diversity includes: oligodendrocytes, possible neuronal/glial precursors, glial clusters, neurons and axon fibers. Concerning the axon fibers, they cross to the contralateral side along the roof of the fourth ventricle, at the border between lobes I and X. Nevertheless, the function of these fibers, anatomical origin and destiny are unknown.

The aim of this study is to determine the origin of the axon fibers of the SVZ of cerebellum that pass along the roof of the fourth ventricle.

Methods: Stereotaxic injection of Fluorogold and BDA were performed in CD1 mice. Cerebella from transgenic mice Thy1-H:YCaMP (neuronal) and Pax-2-GFP (GABAergic interneurons) were processed for histology and fluorescence confocal microscopy. Immunofluorescence for the GABA vesicular transporter (VGAT) was performed.

Results: Fluorogold and BDA traced the fibers of the SVZ to the fastigial medial nucleus (Med) and cerebellar vestibular nucleus (VeCb). This was consistent with the label detected in the Thy1-H: YCaMP mice. Two types of fibers were identified in terms of thickness of the projections (possible resembles the myelinated and non-myelinated axons). Pax2-GFP mice revealed the presence of local GABAergic neurons whereas label for VGAT was detected in terminals around neurons in Med, and in the ventromedial cord of the roof of the fourth ventricle.

These preliminary results show a heterogeneous neuronal population composed by myelinated and non-myelinated axons; one group is composed of GABAergic interneurons. Neuronal tracers indicate that the
axon fibers originate in the Med and the VeCb. Further studies are on-going to fully characterize this group of neurons and their functional role.

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61. SHORT-TERM COMBINATION OF MODERATE EXERCISE AND LITHIUM AVOIDS AMYLOID B-INDUCED ALTERATIONS IN HIPPOCAMPAL FUNCTION

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Abstract:
Alzheimer disease (AD), and other related dementias, are characterized by cognitive-impairment and depression, which are the consequence of a variety of amyloid beta (Aβ)-induced biochemical, cellular and neural network dysfunctions. Despite that several pharmacological and non-pharmacological approaches have been tested to revert these alterations, their translation to the clinics is limited. Particularly when applied to elderly, the toxicity associated to most drugs and the challenging of some behavioral approaches are associated with this translational limitation.

Thus, it is likely that the combination of moderate dosages of drugs and behavioral interventions could potentially be beneficial in AD-treatment. Here, we tested whether the combination of moderate exercise (Mod-Ex) and short-term lithium treatment (STLi) could avoid Aβ-induced cognitive impairment along with several underlying biochemical, cellular and network dysfunctions.

Our results show that the combination of Mod-Ex and STLi, which produce only partial beneficial effects themselves, produce a neuroprotective state that precludes Aβ-induced amnesia and depression. Such neuroprotection involves the inhibition of GSK3β activation and the reduction of microglia proliferation. Moreover, the combination of Mod-Ex and STLi not only avoids the inhibition of hippocampal theta rhythm induced by Aβ but potentiates this rhythm activity beyond control conditions, which may be key for the cognitive improvement produced by this therapeutic combination.

Our data supports the use of the combination of Mod-Ex and STLi to treat AD and other Aβ-related dementias.

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62. EFFECTS OF INCIDENTAL PHYSICAL ACTIVITY ON LANGUAGE PROCESSING IN OLDER ADULTS

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Structured physical activity has been associated with an improvement in cognitive processes in the elderly; however, no effect on language has been yet reported. It is well known that older adults have difficulties in language comprehension, which are associated with higher demands of working memory. We hypothesized that physical activity could positively affect working memory and language comprehension processing. Older adults perform, mainly, incidental physical activity (IPA) as a result from every day activities. Therefore, the aim of this study was to evaluate how IPA levels affect language comprehension processing of healthy older adults with high (H-IPA) vs. low (L-IPA) levels of IPA. Event-related potentials from 34 older adults with H-IPA and 34 with L-IPA were collected during a language compression task (conditions: working memory load (low and high) and gender agreement between noun and adjective (agreement and disagreement)). There were no differences between groups in percentage terms of correct answers or reaction times. Nevertheless, electrophysiological results showed that the H-IPA group was faster to process the disagreement condition regardless of the working memory load condition, specifically in morpho-syntactic and integration of constituent processes, additionally H-IPA group seem to recruit more efficiently neural resources than L-IPA when they processed the generalized mapping of sentences. These findings suggest that higher levels of IPA are related to better language compression in the elderly, H-IPA group has an electrophysiological pattern more similar to young adults; hence, IPA can be a protective agent of language comprehension.

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63. CHARACTERIZATION OF THE CIRCADIAN SYSTEM IN A TRIPLE TRANSGENIC MODEL FOR ALZHEIMER’S DISEASE (3XTG-AD)

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Albeit the substantial number of reports regarding the alteration in physiological parameters in clinical and experimental studies of Alzheimer’s disease (AD), it is not known if the circadian system is equally affected in this malady as the cortex and the hippocampus. The aim of this project was to gain more understanding on the progressive modifications in the 24 h-cycles of circadian locomotor activity, as well as in the structural alterations in the suprachiasmatic nucleus (SCN) of the 3xTG-AD mouse model of the AD. Male subjects of non-transgenic and transgenic mice were studied at 3, 8 and 13 months of age, to characterize early, intermediate and advanced stages of the neurodegenerative process. Comparisons were also done with the wild type mouse C57BL/6J. The next physiological studies were done: 1) Daily locomotive activity under different protocols of photic stimulation (light-dark cycles, jet-lag and continuous darkness) to finely typify the circadian system of the 3xTG-AD mice; 2) electroretinograms under photopic and scotopic conditions to evaluate the functionality of the neural communication in the retina. The cellular and histological integrity of the SCN was evaluated by the presence of the β-amyloid deposits (Aβ) as well as the hyperphosphorylated
Tau protein (pTau) (both markers of the AD onset). So far, our results indicate very subtle modifications in the 24 h rhythms of locomotor activity under the different light-dark protocols, being more relevant the shortening of the period by almost 40 min in the transgenic mice. In contrast, electroretinograms done at 8 months old mice indicate an alteration in the electrical recording, suggesting a clear degenerative process in the retina of the 3xTG-AD mice. A preliminary conclusion is that the SCN and its underlying circadian activity is just modestly affected in the transgenic mice.

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64. PHOSPHORYLATION OF TAU PROTEIN MODULATES HIPPOCAMPAL THETA ACTIVITY AND PREVENTS EPILEPTIFORM ACTIVITY

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Abstract: Tau hyperphosphorylation at several sites, including those close to their microtubule domain region (MDr) is considered a key pathogenic event for Alzheimer’s disease (AD) development. However, at the very early disease stage, phosphorylation increase in the MDr domain of tau protein was found to promote neuroprotection by preventing epileptiform activity. Mechanistically, our data showed that phosphorylation of tau protein can modulate the hippocampal theta activity by reconfiguring the hippocampal circuitry response. Overall, our work confronts the leading AD hypothesis that postulate the fosforilación of tau protein as the pivotal event leading to neurodegeneration.

&Leading authors: M.

Keywords: Tau, phosphorylation, theta activity, epileptiform activity, receptor overexcitation, and compensatory mechanism.

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65. ELECTROPHYSIOLOGICAL AND KINEMATICS INITIAL EVALUATION IN A GROUP OF OLDER ADULTS USING A COMBINED COGNITIVE-MOTOR INTERVENTION PROGRAM

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Background: In the aging process, occurs changes in the central nervous system and motor performance, this generate changes in the duration and variability movement, proprioception, postural stability, gait and
balance. The brain electrical activity has been used for the evaluation of this process.

**Objective:** Assess the initial kinematic state and electrical brain activity in a group of older adults using a combined cognitive-motor intervention program.

**Methods:** fifteen elderly with a normal cognition were evaluated (13 female, 2 male), it was a mean age of 70.8 years ± 5.2 SD. The following tests were applied: Tinetti scale (gait and balance), and a motor functional evaluation through a movement sensor. Also, it was performed a electroencephalographic evaluation by spectral analysis in classical frequencies. 30 sessions of combined cognitive-motor intervention will be performed and later re-evaluated.

**Results:** The Tinetti scale showed an average of 24.9 ± 3.5 SD. 67% of participants showed no risk of falls, 13% had a minimal risk and 20% had a high risk. 100% showed significant alterations in electroencephalographic spectral analysis: significant increase of energy in the slow bands (theta-delta) in 4 participants; and significant increase in fast frequencies (alpha-beta) in 6 participants. Both alterations toward fronto-temporal regions.

**Conclusions:** Subjects are cognitively healthy and the preliminary evaluation does not show kinematic alterations and electrical brain activity that prevent the onset of the combined cognitive-motor intervention program.

(M)

### 66. OUTCOME OF INFANTS AT RISK OF BRAIN DAMAGE AFTER KATONA NEUROHABILITATION THERAPY

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**Objective:** To evaluate Katona’s neurohabilitation therapy in preterm and term infants with risk factors for brain damage followed up to 24 months of age.

**Methods:** We selected a sample of 262 infants from 25 to 40 weeks of gestational age (GA) with risk factors for brain damage. White matter and grey matter injuries were observed in the MRI evaluations of 84% of the infants (diffuse white matter abnormalities, cystic periventricular leukomalacia, haemorrhages, infarcts, etc.). Mean birth weight increased with GA as expected. The minimum birth weight revealed that groups with infants who had a GA between 25 and 36 weeks had at least one subject with a birth weight of less than 1500 gr. Katona’s treatment (neurohabilitation) began before 2 months of corrected age. Treatment was intensive, sustained for at least 12 months, and required family participation. Neuropediatric examinations and Bayley Scales of Infant and Toddler II performed and both the Mental Development Index (MDI) and the Psychomotor Development Index (PDI) were recorded. MDI measures environmental responsiveness, sensory and perceptual abilities, memory, learning, and early language and communication abilities; PDI measures both gross and fine motor skills.

**Results:** Abnormal MRI findings were observed in 84% of infants.

**Outcome:** Bayley-II scales showed that 80% of infants with a GA of less than 29 weeks and 85% of infants with a 30-40 week GA had significantly normal MDI and PDI scores.

**Conclusion:** Diagnosis and treatment using neurohabilitation in newborns at risk of brain damage is recommended.

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The authors acknowledge the collaboration of all the members of the Neurodevelopmental Research Unit, in particular Teresa Alvarez-Vázquez, Paulina Alvarez-García, Héctor Belmont-Tamayo, Thalia Fernández,
67. FOLLOW-UP OF A CLINICAL CASE OF A PATIENT INTERVENED IN UTERUS BY PORENCEPHALIC CYST IN THE TEMPORO-OCcipital REGION TREATED WITH NEUROHABILITATION

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Background: Intrauterus fetal surgery is a procedure that helps to reduce fetus damage to protect the fetus wellness. Porencephalic cystic is an abnormal lesion inside of the brain matter as result of an intraparenchymal hemorrhage, sepsis or cerebro vascular infarction. According literature this kind of cyst may be unilateral or bilateral; producing: hemiparesis, hemiplegia, seizures, mental deterioration and even death. Thanks to neurohabilitation and cerebral plasticity, it is possible to compensate the lesion by the intensive repetition of the elemental sensorimotor patterns to achieve a cerebral reorganization and change the prognosis of the patient. We present a case of a term patient who has a porencephalic cyst on the left hemisphere operated in utero at 26, 28 and 35 weeks of gestation, which was treated with neurohabilitation, obtaining a good evolution. The motor developmental milestones were: cephalic control at 12 weeks, seated position at 35, crawling pattern at 45 weeks.

We made an analysis of 8 children with porencephalic cyst not operated in uterus and treated with the Katona procedure and, we obtained a motor developmental mean to compare with the patient’s evolution, finding that cephalic control at 21 weeks, seated position at 42, crawling pattern at 79 weeks.

Conclusion: The motor development of the patient was above the average of children with the same problem and very close to the parameters of a healthy child. This result suggests that fetal surgery may be a good option to avoid the motor problems produced by porencephalic cyst. However more studies are necessary to reach a final conclusion.

Acknowledgments: The authors acknowledge PAPIIT IN200917 support and Arenas Alejandra, Álvarez Paulina, Belmont Héctor and Ricardo-Garcell Josefina by their help in this project.

68. ON THE HYPERPOLARIZATION ACTIVATED ION CURRENT OF XENOPUS OOCYTES, ITS RELATION TO HCNS EXPRESSION AND GATING PROPERTIES OF HCN2 MUTANTS

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A diversity of ion conductances have been identified in frog oocytes. One of the endogenous oocyte ion-currents is activated upon extreme negative hyperpolarization potentials of the membrane. In an attempt, to identify the molecular component of this current, we isolated the four cDNAs that code for the Xenopus tropicalis hyperpolarization activated cyclic nucleotide-gated channels (HCN1-4), probed their function in HEK293 cells and generated single-site mutants of a well conserved series of amino acids neighboring the selectivity filter that generated ion-currents. The ion currents induced by hyperpolarizing pulses were recorded using two-electrode, voltage-clamp in oocytes of X. tropicalis stepping the membrane from -60 mV to -140. The genome sequence of this frog
was explored to determine the presence of HCN-encoding genes, four open reading frames (ORFs) were identified, cloned, sequenced and finally introduced into expression plasmids (pcDNA3 or pIRES-EGFP), and transfected in HEK293 cells or used as templates to produce mRNA to be expressed in X. laevis oocytes and recorded by voltage-clamp.

In X. tropicalis oocytes the current activates and inactivates slowly. The current-voltage relationship showed an inward rectification at potentials more negative than -130 mV and the reversal potential was -23 +/- 1.5 mV. The cDNAs of HCN1, 2 and 3 resulted as predicted from GeneBank whereas HCN3 a truncated form was predicted to be non-functional and was named HCN-like. However, HCN-like, co-expressed with the other genes, blocked the generation of functional channels. Finally, the HCN2 mutant LCI -> AAA shows changes in the activation and inactivation kinetics, activation threshold and potassium modulation.

In conclusion, we show that HCN RNAs are expressed in X. tropicalis oocytes. The HCN-like RNA heteromerizes with other HCNs and blocks their expression. The 391LCI393 amino acid sequence of HCNs is important to provide an effective gating of the ion channel.

This work was supported by PAPIIT (A.H. TA200217 and A.M-T 206616) and CONACYT 220224.

69. RAMSAY HUNT SYNDROME: CASE REPORT AND REVIEW OF LITERATURE

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OBJECTIVE:
We present a case report of a 46-years-old female, with no past medical history. She develops, a left, retroauricular and occipital erythematous vesicular rash on day 1. The rash was described as a burning pain with a score of 9/10 in the Visual Analogue Scale (VAS); treatment with valacyclovir for Varicella Zoster Virus (VZV) was initiated. On day 12 she returns due to pain and left-side facial palsy. During the physical examination, the vesicular rash was appreciated on the anterior pillar of the pharynx, external auditory conduct and cervical region; these lesions on the left-side. New findings contribute to the diagnose of Ramsay Hunt Syndrome (RHS). Acyclovir, prednisone, gabapentin and rehab therapy was added to the treatment.

MATERIALS & METHODS:
Anamnesis, physical and neurological examination, laboratory exams, electrocardiogram and brain imaging were performed. Simple and contrast magnetic resonance (MR) of encephalon were performed; special attention was paid on cranial nerves and brainstem. We could identify an enhance of the VII cranial nerve in the internal auditory canal (T1 sequence with gadolinium).

RESULTS:
Full recovery was achieved due to prompt treatment with corticosteroids, antiviral and facial rehab therapy.

CONCLUSION:
Facial palsy occurs annually in 30 of 100 000 individuals in the general population; RHS incidence is 5 of 100 000 people, being the second most common cause of atraumatic peripheral facial paralysis. It is also a rare and severe complication of VZV, this entity is clinically characterized by otalgia, vesicles in the pharynx/auditory canal and facial palsy. Without treatment, full recovery of the facial paralysis occurs in as little as
20% of cases. Early identification of the syndrome and prompt treatment prevents future complications of RHS.

REFERENCES:

70. DECODING SHAPE, TEXTURE AND WEIGHT IN THE SOMATOSENSORY SYSTEM

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In a previous study we found that the activity patterns of the parietal cortex could predict the category of an object explored through touch by human participants, this suggested that the parietal cortex have specialized groups of neurons that encode high level characteristics of objects. The perception of an object through the somatosensory system is built from the activity of specialized groups of neurons tuned to different properties of the object, starting from low level characteristics such as texture to increasingly high level characteristics such as their function. In the present study we tested if a cerebral region can encode more than one low level characteristic of the same stimulus. We acquired functional resonance images of eight human participants while they explored objects that differed in three properties: weight, shape and texture. Using multivariated pattern analysis, we analyzed the whole brain and tested which region’s activity could decode the tested properties. We found that the activity in the anterior intraparietal sulcus (AIPs) could predict above chance (p < 0.01) the texture and shape of the objects, but not the weight. However, the same region could predict the identity of the object (which can only be done by considering the three properties at the same time). These results suggest that the AIPs not only process low level characteristics of an object (texture and shape) but it also functions as an integration node.

We thank to Erick Pasaye and Juan Ortiz for all their help during image acquisition.

71. SEARCH OF α-CONOTOXINS FROM Conus princeps VENOM TARGETING NEURONAL ha3β2 NICOTINIC ACETYLCOLINE RECEPTORS

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Marine snails belonging to the genus Conus are venomous species. The Conus venom has about 50 to 200 different neuroactive peptides termed conotoxins (CTXs). One family of CTXs referred to as α-conotoxins (α-CTXs) are nicotinic acetylcholine receptor (nAChR) antagonists. Conus princeps, a species from the
Mexican Pacific, has been insufficiently studied. Therefore, the objective of this study was the identification and purification of α-conotoxins from C. princeps venom targeting neuronal nAChRs of the hα3β2 subtype. Crude venom extract was fractionated by reversed phase-high performance liquid chromatography (RP-HPLC). Biological activity of each RP-HPLC fraction on hα3β2 nAChRs was assessed by voltage-clamp recording in Xenopus oocytes (n = 5) measuring the response to acetylcholine (ACH) [100 μM ACh-induced current (I_ACh)]. The fraction with the highest activity was purified. Thirty seven fractions were obtained from C. princeps venom and we identified 17 fractions that blocked >25.0 % of the ACh-induced response, among which 5 fractions inhibited >50.0 %. As compared to other fractions, significantly higher inhibition (p < 0.001) was observed with fraction number 10 (F10, ~0.1 μg/μL), which blocked 76.9 ± 3.3 % of the ACh-induced response and its effect was slowly reversible. F10 was then further purified by RP-HPLC and it yielded 4 major fractions; one of them (F10-4) inhibited 93.1 ± 7.9 % and its effect was slowly reversible, whereas another fraction (F10-2) increased the ACh-induced response up to 41.92 ± 9.18 % and its effect was slowly reversible. The identification and chemical and electrophysiological characterization of selective α-CTXs that target the neuronal nAChR hα3β2 subtype could provide novel molecular tools and therapeutic agents for the treatment of a range of neurological disorders that involve this receptor.

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72. INFLUENCE OF OLFACTORY ENRICHMENT ON THE ACTIVATION OF THE BULBAR CIRCUIT

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Olfactory enrichment (OE) consists of passive exposure to different odors. Studies in rodents show that the OE improves memory, odor discrimination and increases neurogenesis. Clinical evidence with a similar paradigm called olfactory training produces beneficial effects on Parkinson’s disease patients and old adults. Data from our laboratory showed that OE exerts a neuroprotective effect against amyloid beta peptide-induced inhibition of main olfactory bulb (MOB) activity in vivo and in vitro. However, the changes in the neuronal network dynamics underlying OE and its neuroprotective action are not known. Therefore, we evaluated the effect of OE on bulbar network activity by measuring the activation of the glomerular layer (GL) by intrinsic optical signals. We also recorded the whole MOB with an array of multiple electrodes and tested animal’s innate olfactory preference. We used male 8-weeks-old CD-1 mice divided in control an odor-exposed groups. OE consists of exposing animals to 21 different odors, one per day (2 exposures per day), for 21 days. Here, we show that the OE changes the activity of the MOB by refining the spontaneous activity and the evoked response to odors. OE reduced the amount and increased the size of activated glomeruli, it also increased the coherence between layers in olfactory bulb. In addition, OE improves olfactory detection and discrimination of odors. It is likely that these changes are due to an increase in inhibition within the MOB circuit, which may contribute to the improvement in the olfactory function and the neuroprotection produced by OE.

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73. THE USE OF THE CONFOCAL MULTIPHOTON MICROSCOPE AT INB

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The microscopy unit has several microscopy systems including the light microscope, fluorescence microscope, confocal microscopes, electronic microscope and a high-resolution microscope. The confocal multiphoton microscope is a very recent technique in neuroscience for obtaining images from fixed tissue as well as in vivo and in vitro (embryos and slices) preparations. It is possible to obtain simple images or composed images from individual images expression of the events, static or dynamic depended of the experiment. The objective from this work is to demonstrate the high potential of the confocal microscope and the multiphoton microscope or combination of both in the investigation. In particular, the Confocal 780 Laser Scanning Microscopy (LSM) from Carl Zeiss, is a vertical microscope with double heads, has 3 modules attached where it can be obtained confocal images with the LSM modules, the Non Descanned Detector (NDD) and the LIVE module. Additionally, this microscope has photon lasers 458 nm, 488 nm, 514 nm, 561 nm, 633 nm, diode lasers 489 nm, 532 nm and a multiphoton laser (Coherent) with a wavelength range between 690 – 1040 nm. In this way, it is possible to obtain simple images (snap), composed z-stack images (x, y, z), times series and panoramic composed images (tile scan).

We are thanking for image collaboration Ing. Rafael Olivares-Moreno, Dr. Gerardo Rojas-Piloni, Dra. Guadalupe Martínez-Lorenzana, Dr. Abimael González-Hernández, Dr. Miguel Condés-Lara and Ing. Ma. Lourdes Palma-Tirado. A.

74. APPROACHING THE STUDY OF EMPATHY THROUGH THE TMS STIMULATION OF THE TEMPORO–PARIETAL JUNCTION

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Empathy has been conceived as a pivotal function for successful social interactions. It has been defined as the ability to share the emotional experience of others (“I feel what you feel”). It becomes evident when things go wrong, as when we are misunderstood by someone else and by consequence our feelings get hurt. Among others, one of the main brain areas related with empathy has been the temporal–parietal junction mainly in the right hemisphere (rTPJ). To better understand the functional and behavioral relationship of this area under the light of empathy, we plan to do a physiological modification of the rTPJ using transcranial magnetic stimulation (TMS) applying an intermittent theta burst stimulation (tbs), an inhibitory protocol. We are planning to locate the subject’s rTPJ by neuronavigation using BrainVoyager 3D reconstruction to project the fMRI activation onto the high resolution anatomical images. 12 male adult participants sorted in two groups (sham – tbs, tbs – sham, counterbalanced), will perform the Empathy Quotient (EQ) test. The EQ consist in 60 self-evaluated items but in this project participants will answer 30 items after tbs and 30 items after sham, once the effect of tbs has disappear. We expect to measure lower empathy scores in the post tbs stimulation condition compared to the sham condition, highlighting the importance of the TPJ for empathy processes. This result will reflect the importance of combining MRI and neuronavigation methods in order to improve the localization of stimulation delivery, opening the possibility to precisely stimulate areas that respond to specific task execution.

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75. SYNAPTIC PLASTICITY EVOKED BY SOMATOSENSORY STIMULATION IN THE CORTICO-
THALAMUS-STRIATAL CIRCUITS

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It has been proposed that network activity in the dorsolateral striatum (DLS) integrates sensory-motor inputs originating in the cortex and thalamus to produce automatic motor commands. Both projections have been shown to express multiple types of synaptic plasticity, and much attention has been given to the role of synaptic plasticity in sculpting network activity. Nevertheless, there’s no direct evidence of the specific role of the synaptic plasticity evoked on each of these pathways or their interactions to the final behavior of the striatal microcircuit. The main object of this work is to produce a reliable model in vivo, to study the fine structure of the network dynamics induced by the activation of the thalamus- and cortical-striatal pathways. To this aim we have developed a robust and reliable preparation in anesthetized rodents, where somatosensory stimulation of forelimbs and hindlimbs consistently produce sensory representations in the thalamus-cortical-striatal circuits. Our preparation is suitable for high-density electrophysiology and sensory, pharmacological and optogenetic stimulations. With this method, we have been able to provide functional evidence of a direct somatosensory pathway to the DLS arising directly from the forelimb region of the thalamus. We have also proved that in vivo, somatosensory stimulation of the forelimbs produce short-term synaptic changes in the cortex and striatum. Ongoing analysis and experiments using this method will help us to disentangle the neural dynamics evoked by pathway-specific manipulations.

Founding: PAPIIT - IA201916. M

76. BINDING SITES FOR N-BUTYL-β-CARBOLINE-3-CARBOXYLATE (β-CCB) IN THE α3β2γ1 GABA_A
RECEPTOR IDENTIFIED BY SITE-DIRECTED MUTAGENESIS

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Cellular communication through neurotransmitters is a very important process to maintain homeostasis in pluricellular organisms. The GABA_A receptor expressed in both oligodendrocytes (OLs) and neurons is a GABA-activated receptor-channel selective to Cl- ions. It is composed by a combination of 5 subunits from 19 known. The specific subunit combination depends on the cell lineage, and affects its function and pharmacology. Results from our laboratory support the idea that OLs express a GABA_A receptor composed by α3β2γ1 subunits, while in neurons the most frequent combination is α2β1-3γ2. β-carbolines are a family of molecules that have an inverse agonist effect on the neuronal GABAA receptor, inhibiting the response to GABA, however, in OLs β-carbolines have the opposite effect and potentiate the GABA response. It has been shown that β-carbolines are byproducts in several metabolic pathways, and might act as endogenous modulators on the neuronal GABAA receptor, inhibiting the response to GABA, however, in OLs β-carbolines have the opposite effect and potentiate the GABA response. It has been shown that β-carbolines are byproducts in several metabolic pathways, and might act as endogenous modulators on the GABAA receptor, through the benzodiazepine (BDZ) binding site. In this study, we modified the GABA_A receptor, α3β2γ1, by introducing mutations that block the interaction of BDZs to their binding sites. Then, using the Xenopus laevis oocyte as a cell model, the mutated GABAA receptors were heterologously expressed, and characterized electrophysiologically, to evaluate the effect of the β-carbone named β-CCB on the response to GABA. The results showed that the mutation blocking the high-affinity BDZ site (in the α3-γ1 subunit interphase) increased the positive effect of β-CCB, while mutations in a low-affinity BDZ site (in the second α3 and β2 transmembrane domains) eliminated the effect of β-CCB. In conclusion, β-CCB acts on the GABA_A receptor through two different binding sites producing opposite effects on its function. These results indicate that β-carbolines might be used to specifically potentiate the GABA response in oligodendrocytes.
We are grateful to Biol. Felipe Ortiz Cornejio for his technical assistance. This study was supported by grants from CONACYT No. 252121 and DGAPA No. IN205615 to R.O.A. laboratory.

**77. BRAIN FEATURES ASSOCIATED WITH PRETERM BIRTH AND PERINATAL RISK FACTORS ARE REVELED BY “MACHINE LEARNING”**

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**INTRODUCTION.** Infants and children with a history of preterm birth and with perinatal risk factors (PRF) for brain injury may exhibit structural brain abnormalities—such as grey matter (GM) lesions (not often observed in clinical practice)—that affect motor and/or cognitive functions. Neural network is one kind of machine learning techniques that, with the inclusion of highly complicated model structure generated by “deep learning” technique, may achieve accurate prediction of clinical conditions based on certain brain features.

**AIMS.** (A) Distinguish between children with different gestational age at birth, and (B) distinguish between children with different PRF.

**METHODS.** A total of 607 infants and children (326 males; age: 3.25 ± 2.22 years, μ±σ) were recruited. MP-RAGE T1w MRI volumes were acquired at 3T. We obtained: surface area, cortical thickness, curvature and GM volume. Subjects were divided based on the gestational age (before 30 weeks, 30-37 weeks and after 37 weeks) and in seven sub-groups based on the PRF for brain injury and/or other clinical condition (hypoxic-ischemic; neonatal hyperbilirubinemia; previous two; stroke; malformations; other; healthy).

**RESULTS.** The brain features identified as having classification abilities were sulci associated with temporal and occipital regions bilaterally. The neural network was able to distinguish (A) children with pre-term births from those with full-term births with a classification accuracy of 78.42% ± 0.04% (μ ± σ) and (B) among all seven sub-groups in the second classification with an accuracy of 96.27% ± 0.01%. CONCLUSIONS. Our results suggest that the surface area of certain GM regions in infants and children can be associated with some aspects of perinatal pathologies and/or risk factors for perinatal brain injury.


**78. CLINICAL LONGITUDINAL MONITORING THROUGH THE ACQUISITION OF GROWTH MOTOR DEVELOPMENT MEASUREMENTS AND ASSESSMENT BY THE AMERICAN SPINAL INJURY ASSOCIATION (ASIA) IN INFANTS BORN WITH MYELOMENINGOCELE INTERVENED WITH NEUROHABILITATORY THERAPY**


**Objective:** To evaluate the effect of neurohabilitation therapy (Katona) in infants with myelomeningocele at different levels of the neural tube and also bearers of other risk factors for neurological damage.
**Methods:** A group of 7 infants with neural tube defect, specifically myelomeningocele, at a different presentation level and with other risk factors for neurological damage were followed. From the beginning, the evaluation was carried out by Katona maneuvers. The ASIA neurological evaluation was also used, which allows identifying the myotome and dermatome, affected, and changes were recorded with it. Also, the age at which the gross motor development milestones were established was recorded. Neurohabilitation treatment (Katona) started at an early age, before 8 weeks of corrected age, they went daily to the implementation and correction of their neurohabilitatory program, with greater emphasis on vestibular, proprioceptive and sensorial stimulation, the program was repeated at home 2 more times. Cognitive assessment was also monitored through the Bayley’s II and III tests since the infants began the program.

**Results:** There was a delay in the acquisition of locomotion milestones, specifically crawling and marching, which, in some cases, by the level of injury, literature refers not to be achieved. Also, in the cognitive area, they are kept within parameters within normality.

**Conclusion:** the results obtained so far are favorable, since the quality of life of these patients has improved considerably. Although at present they are still indicated as disabled in the motor and cognitive areas, their actual performance suggests that they will reach a much better outcome that the one referred in the literature.

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**79. OUTCOME OF A PATIENT WITH HYPOXIC-ISCHEMIC ENCEFALOPATHY (HIE), INTRAVENTRICULAR HEMORRHAGHE (IVH) AND PERIVENTRICULAR LEUKOMALACIA (PVL), TREATED WITH NEUROHABILITATION AND NEUROREHABILITATION**

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**INTRODUCTION:** HIE is a pathological entity that affects 1-2 of every 1,000 mexican newborns. It is a consequence, as its name indicates, of oxygen failure in the brain. It usually affects areas such as basal ganglia, thalamus and the cortex, among others, which is why it is important to provide a timely suitable treatment.

**OBJECTIVE:** To evaluate the neurodevelopmental evolution and functional level (FL) of a patient with HIE Sarnat II and IVH, with the time of consolidation of gross motor milestones and the Gross Motor Function Classification System (GMCS).

**CLINICAL CASE:** A 40-week gestational age male patient with antecedents of risk factors for brain damage (epileptic mother who ingested anti-epileptic drugs, perinatal asphyxia caused by meconium aspiration) diagnosis of HIE GI and IVH GI, magnetic resonance images suggesting PVL. Clinical diagnosis: Cerebral Palsy with Spastic Quadriparesis. The patient was admitted at 9 weeks old into a neurohabilitation protocol. Subsequently, neurorehabilitation techniques were used at 11 months due to a torpid evolution. It was applied botulinum toxin at 2 years to treat plantiflexor muscles and it was performed a surgery for the right Achilles Tendon at 3.2 years along with rehabilitation treatment.

**RESULTS:** Head Control at 41 weeks (w), sitting 46w, creeping 56w, protective reactions 72w, crawling 56-72w, standing 116w, gait 137w.

**CONCLUSIONS:** According to the literature, patients who are affected by a HIE, IVH or PVL have a high incidence of CP, a sequel that frequently convert them into custodial patients. Thanks to multidisciplinary interventions, the patient obtained a functional level that allows him to be independent in several daily activities.
Acknowledgments: The authors thank Belmont Héctor, Arenas Alejandra and, Ricardo-Garcia Josefina for their collaboration. Grants CONACYT 166772, CONCYTEQ 218556 and PAPIIT IN200917 are acknowledged for their support.

80. FUNCTIONAL EXPRESSION OF GABA$_A$ RECEPTORS IN CEREBELLAR GLIAL CELLS OF THE WHITE MATTER

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Abstract

Background: The cerebellum is involved in the coordination of movement by integrating sensory and motor pathways; its cellular composition is dominated by GABAergic neuronal types, among them the Purkinje neurons that project their axons through the white matter (WM). The cellular composition of the WM includes glial cell bodies corresponding to oligodendrocytes, microglia, NG2 glia and astrocytes. Several studies have reported that glial cells express GABA$_A$ receptors, pentameric proteins that permeate chloride and are modulated by drugs of clinical relevance such as barbiturates and benzodiazepines. Unlike its hyperpolarizing action in mature neurons, GABA$_A$ depolarizes glial cells and neural precursors through the activation of GABA$_A$ receptors. In early stages of development, this action is involved in events of cell proliferation, differentiation and migration. Functional expression of GABA$_A$ receptors in glial cells was previously reported in regions such as the corpus callosum and striatum, however, is still unknown if this also occurs in the WM cells of the cerebellum.

Aim: To determine whether cerebellar glial cells in the white matter express functional GABA$_A$ receptors.

Methods: GFAP-EGFP transgenic mice at P7-P9 were used. The brain was isolated and 250 μm thick coronal slices were obtained from the cerebellum. Glial cells from the white matter were recorded by whole-cell voltage-clamp and their responses to GABA$_A$ agonists were evaluated. The recording micropipette was filled with 0.5% biocytin to reveal coupling and cell morphology after processing for histochemistry.

Results: GFAP$^+$ cells do not respond to muscimol, a GABA$_A$ receptor agonist (N= 9), however 1 out of 2 types of GFAP$^-$ cells responded to GABA and muscimol (N= 4), a current-voltage relation protocol revealed an outward rectifying current and biocytin did not diffuse to surrounding cells; in contrast, the second GFAP$^-$ cell type did not respond to muscimol, showed passive current profiles and biocytin diffused to neighboring cells (N= 4).

Conclusion: Functional GABA$_A$ receptors were recorded in a fraction of GFAP$^-$ cells that showed voltage dependent currents with an outward rectification, no coupling and a ramified morphology with long processes. Surprisingly, GFAP$^+$ cells and a fraction of GFAP$^-$ cells were coupled, showed passive currents but no response to GABA nor muscimol.

Key words: GABA, Glia, GABA$_A$, Cerebellum.

81. EFFECT OF THYROID HORMONES ON THE DEVELOPMENT OF ZEBRAFISH (Danio rerio) AND AXOLOTL (Ambistoma mexicanum)

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Thyroid hormones are key regulators of development, growth and metabolism in all vertebrates. Whereas the role of thyroid hormones during development of mammals has been well characterized, the effects in basal vertebrates such as fish and amphibians are poorly understood. We took advantage of zebrafish and...
Axolotl ex-utero development to analyze the effects of exogenous thyroid hormones during development. To this end, and as an initial approach, we followed different immersion treatment protocols in both species. Axolotl: Embryos were treated with 50 nM T4, T3 or T2 until eclosion (14 days) and analyzed their effects on development. We observed that embryos treated with T3 and T2 showed increased survival rate and accelerated development, as observed in their morphology and eclosion timing. In contrast, embryos treated with T4 or vehicle showed no changes. Zebrafish: Embryos (0 hpf) were treated until eclosion (2 days) with 0.1, 5, and 50 nM of T3 or T2. Neither treatment had an effect on morphology, heart rate, pigmentation or eclosion timing with T2- or T3-treatment as compared with vehicle treated embryos. In another set of experiments designed to gain insights about function of the thyroid hormone receptor β1 long isoform (L-TRβ1) during development, embryos were microinjected with the corresponding mRNA. Overexpression of L-TRβ1 induced a delay in the eclosion timing, as well as changes in embryo morphology at 34 hpf, as compared with the adequate control. These preliminary results suggest that vertebrate species exhibit different sensitivity to thyroid hormones during development. Furthermore, the fact that overexpression of L-TRβ1 delay zebrafish development suggests its role on vertebrate development. A.

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82. PROLACTIN PROTECTS AGAINST BONE LOSS IN INFLAMMATORY ARTHRITIS

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Prolactin (PRL) promotes cartilage survival, reduces joint inflammation, pannus formation, and bone destruction in rats with adjuvant-induced arthritis (AIA). Here, we investigate the mechanism of PRL protection against bone loss in AIA and in monoarticular AIA (MAIA). Joint inflammation, trabecular bone loss and osteoclastogenesis were evaluated in rats treated with PRL (via osmotic minipumps) and in mice with MAIA that were null (Prlr/-) or not (Prlr+/+) for the PRL receptor. To help determine target cells, synovial fibroblasts isolated from healthy Prlr+/+ mice were treated or not with T-cell-derived cytokines (Cyt: TNFα, IL-1β, and IFNγ) with or without PRL, and these synovial cells were co-cultured or not with bone marrow osteoclast progenitors from Prlr+/+ or Prlr-/− mice. In AIA, PRL treatment reduced joint swelling, increased trabecular bone area, lowered osteoclasts density, and reduced mRNA levels of osteoclast-associated genes [tartrate-resistant acid phosphatase (Trap), cathepsin K (Ctks), matrix metalloproteinase 9, (Mmp9), and receptor activator of nuclear factor κB or RANK (Tnfrsf11a)], of genes encoding cytokines with osteoclastogenic activity [Tnfa, Il1b, Il6, and receptor activator of nuclear factor κB ligand or RANKL (Tnfrsf11)]. Prlr-/− mice with MAIA showed enhanced joint swelling, reduced trabecular bone area, increased osteoclast density, and elevated expression of Tnfa, Il1b, Il6, Trap, Tnfrsf11a, and Tnfrsf11. The expression of the long PRL receptor form increased in articular joints, and in synovial membranes and cultured synovial fibroblasts treated with Cyt. PRL induced the phosphorylation/activation of signal transducer and activator of transcription-3 (STAT3) and inhibited the Cyt-induced expression of Il1b, Il6, and Tnfrsf11 in synovial fibroblast cultures. The STAT3 inhibitor S31-201 blocked inhibition of Tnfrsf11 by PRL. Finally, PRL acted on both synovial fibroblasts and osteoclast precursor cells to downregulate Cyt-induced osteoclast differentiation.

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83. IN SEARCH OF A RELIABLE MEASURE FOR THEORY OF MIND IN HEALTHY MEXICAN ADULTS

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Theory of Mind (ToM) refers to the ability to attribute mental states to oneself and to others, as well as to understand that those of others may differ from ours. ToM can be divided into two components, an affective one, which involves the comprehension of emotions, feelings or affective states and a cognitive component, which implies the comprehension of beliefs, thoughts or intentions. One of the most used tests to evaluate the affective component of ToM, is the Reading the Mind in the Eyes Test (RMET) designed by Baron-Cohen et al. (2001) and a novel way to evaluate the ToM is the Short Story Test (SST) that evaluates the cognitive component of ToM and was designed in 2013 by Dodell-Feder et al. There are also tests that aim to measure both components of ToM as the Yoni test, designed by Shamay-Tsoory & Aharon-Peretz (2007). The purpose of the present study was to evaluate both components (affective and cognitive) of ToM in a Mexican sample and to examine the reliability of the tests. The participants were Mexican college students, with Spanish as their mother tongue (n = 116, 44 men; mean age = 23.06 ± 3.61 years). The RMET and the SST were administered to all participants, in addition a part of this sample (n = 16, 7 men; mean age = 21.25 ± 4.23 years) responded to the RMET on a second occasion and the Yoni test. The RMET and the SST correlated significantly, whereas the Yoni test correlated with the RMET. Nevertheless, the tests differ in their internal consistency and in test-retest reliability. In conclusion, although these tests seem to evaluate the same construct, the results show differences that are worth exploring within the Mexican population.

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84. CEREBRAL ANGIOSPASM: CASE REPORT AND REVIEW OF LITERATURE.

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OBJECTIVE: We present a case report of a 56-year-old feminine patient who suffered from subarachnoid hemorrhage and she has high risk of neurological deficits by cerebral angiospasm. To prevent sequels, we determinate indicated treatment using Magnetic Resonance (MR) and Cerebral Panangiography (gold standard).

INTRODUCTION: Angiospasm in cerebral circulation is a condition with high risk of mortality after aneurismal subarachnoid hemorrhage events. When exist suspicion of vasospasm, it must be kept during ICU care to look out any signs or symptoms and prevent neurologic deficits through timely treatment. Symptomatic angiospasm appears in 20-40% of subarachnoid hemorrhage, affects people with a mean age of 50 years and leads to nearly deaths in survivors the initial subarachnoid hemorrhage. Endovascular intervention techniques for treatment reduce the high risk of mortality by the condition.
MATERIAL & METHODS: The patient suffered intensive, sudden cephalalgia 4 days after 2nd. and 3rd. inferior left molar extraction and anesthesia with Lidocaine 2% and Epinephine. Laboratory, ECG and Cranial TC Scan were performed. Frontal right meningioma in medium frontal gyrus level and subarachnoid hemorrhage on frontal left lobe with minimal mass effect. MR showed right lobe acute hemorrhage and left subarachnoid parietal hemorrhage.

RESULTS: To establish the etiology of subarachnoidal hemorrhage, a Cerebral Panangiography were performed identifying arterial stenosis and dilatation zones in anterior and posterior cerebral circulation, no beading imaging were identified. Patient was treated with Triple H therapy (Hypertension, Hypervolemia, Hemodilution), Nimodipine 60mg VO every 6 hours for 30 days, Dexametazone 8mg IV every 8 hours for 4 days and Atemperato 600 mg VO VID for 2 years.

CONCLUSION: Cerebral Vasospasm is a condition which produces several neurological deficits if it wasn’t detect timely. Endovascular treatment using angioplasty techniques shows great outcomes in treatment of Angiospasm. It is necessary determinate using Cerebral Panangiography to evaluate whether the patient is a good candidate for this kind of intervention. L.

REFERENCES

85. EFFECTS ON THE EXPRESSION OF SEROTONIN RECEPTOR 7 IN ADRENAL CORTEX AFTER A CHRONIC RESTRAINT STRESS CHALLENGE IN RATS

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It has been previously documented that stress response alters the expression of some types of serotonin receptors in specific brain regions involved in the regulation of the Hypothalamus- Pituitary- Adrenal axis (HPA) such as amygdala, hippocampus, Bed Nucleus of the Stria Terminals, as well as Paraventricular hypothalamic nucleus (PVN). Serotonin (5-HT) and its family of transmembrane receptors (5-HTr) have been widely explored in central nervous system because they are related to a vast variety of mood disturbances such as generalized anxiety, post-traumatic stress disorder and major depression. Whilst stress exposure and changes in serotonergic system are well accepted as factors implicated in the development of the latter pathologies, the peripheral role of this biogenic amine and 5-HTr in stress related systemic disorders remains poorly understood.

In this work, we explored the expression of serotonin receptor 7 (5-HT7) in adrenal gland after 15 days of a heterotypic restraint stress protocol in rodents. 8 adult male Wistar rats (210-230g) were submitted to a daily 20 minutes restraint episode or to handling control condition. Both experimental groups were weighted 5 days before starting stress or control treatment through the end of the experiment. Spontaneous motor behavior and anxiety were assessed using the open field exploratory task and elevated plus maze, respectively. Animals’ adrenal glands were fixed with paraformaldehyde, cryoprotected and processed with 5-HT7 immunohistochemistry.
Our results showed robust expression 5-HT7 within the adrenal cortex of chronic stressed rats compared to control group. We also observed significant differences (P<0.001) in body weight of experimental group compared to control condition at days 9 to 15 after starting the experimental protocol. No significant differences were observed in motor behavior in open field nor elevated plus maze between groups. 

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86. EFFECT OF DEHYDRATION-INDUCED ANOREXIA ON THE DENSITY OF MICROGLIA IN RAT HIPPOCAMPUS

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Eating disorders such as anorexia affect three million people in Mexico. Anorexia nervosa is a psychiatric and eating disorder characterized by severe loss of body weight as a result of a reduced voluntary food intake. This disorder predominates in adolescent females (14-19 years, 90-95% of cases). Knowledge about the neurobiology of anorexia is limited, however, magnetic resonance imaging studies reported a decrease in hippocampal volume in patients with this disorder. In addition, recent studies from our group reported that the density of reactive astrocytes increased in a murine model of dehydration induced anorexia (DIA), suggesting that microglia density may increase too. The increase of reactive glial cell density may result in higher expression of pro-inflammatory molecules such as tumor necrosis factor alpha (TNF-α) or interleukin 6 (IL-6).

Aim: To investigate if DIA alters the density of microglia and the expression of Iba-1, TNF-α and IL6 in the rat hippocampus.

Methods: Two experimental series were used with 18 female Wistar rats of 180-200 g distributed in three experimental groups with six animals: a) Control, with ad libitum food and water. b) DIA, with saline solution (2.5% NaCl) and ad libitum food. c) Food Restriction (FFR), with ad libitum water and restricted food depending on the amount ingested by the DIA group one day before. The body weight and food intake was monitored for five days. Animals were perfused intracardially with saline solution + paraformaldehyde (4%), the brains were isolated and sagittal sections were obtained with a cryostat (30 µm). Immunofluorescence studies with the microglia marker Iba-1 were performed to estimate the density of this cell type, while Western blot studies tested the expression of Iba-1, IL-6 and TNF-α.

Results: DIA increased the density of hippocampal microglia in CA3 (232.26%) and dentate gyrus (376.17%). In addition, increased the expression of Iba1, IL-6 and TNF-α. Conclusion: DIA increases the density of microglia in CA3 and dentate gyrus of the rat hippocampus, and increases the expression of Iba-1, IL-6 and TNF-α.

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87. DEVELOPMENTAL REGULATION OF THE PROLACTIN/VASOINHIBIN AXIS IN HIPPOCAMPAL ASTROCYTES

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Prolactin (PRL) and vasoinhibins are two families of hormones associated in a functional axis. Vasoinhibins, named for their inhibitory effect on angiogenesis, vasopermeability and vasodilation, are synthesized through the proteolytic cleavage of PRL, sharing both the N-terminal region. They range in molecular mass between 11 and 18 kDa, depending on the specific sites of action of the proteases involved in their generation, which include cathepsin D, matrix metalloproteinases (MMPs), and bone morphogenetic protein-1 (BMP-1). The balance between the concentration of PRL vs vasoinhibins is determined by the presence and activity of this proteolytic enzymes. PRL and vasoinhibin species are detected in the rat hypothalamus, and other regions of the central nervous system where they trigger opposite effects. In this study we explored the activity of the converting enzymes cathepsin D and MMPs, in astrocytes obtained from the hippocampus of mice in 3 different stages of development. Hippocampi were obtained from the brain of 16 days old embryos (E16), neonate, and adult mice. Isolated astrocytes were obtained from E16 and neonate mice. Lysates from each sample were incubated with 50 ng of rat PRL in a pH 5 or 7 buffer during 24 hours at 37º C in the presence or absence of pepstatin A, an inhibitor of the action of cathepsin D. PRL and vasoinhibins were determined by Western blot. Our results show that endogenous PRL and vasoinhibins are differentially found in the 3 stages. E16 hippocampus contain 3 bands corresponding to vasoinhibins of 14, 16 and 18 kDa, while neonate hippocampus also contain 3 bands but corresponding to vasoinhibins of 14, 16 and 17 kDa, and the adult hippocampus only 2 vasoinhibins of 14 and 17 kDa. Cathepsin D present in the hippocampus and isolated astrocytes cleaved PRL into a vasoinhibin of 16 kDa at all analyzed stages, but the proteolytic efficacy was lower in astrocytes from E16 than from neonates. On the other hand, incubation at pH 7 did not produce any vasoinhibin, suggesting that MMPs are not active in hippocampal astrocytes under basal conditions. Altogether these findings show a cathepsin D developmental-related regulation of the PRL/vasoinhibin axis that operates in hippocampal astrocytes of the mice.

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88. SEXUAL HORMONES ARE NOT SUFFICIENT TO ACHIEVE HIGH SEXUAL RECEPTIVITY IN FEMALE MICE, SEXUAL EXPERIENCE IS REQUIRED

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Female mice have low sexual receptivity (SR) in their first sexual encounters. SR is hormone-dependent and increases with sexual experience, but it is not clear the neural mechanism involved. The aim of our study was to evaluate if supraphysiological doses of estradiol benzoate (EB) and progesterone (P) are sufficient to increase SR, and evaluate if sexual experience induces changes in the activity of the brain areas that modulate this behavior such as: Accessory olfactory bulb (AOB), Medial Preoptic Area (MPOA), Ventromedial Hypothalamus (VMH), and Anterior Cortical Amygdala (ACo). For this study, 54 CF1 ovariectomized female mice primed with 1 μg of EB and 100 μg of P were assigned to one of the following groups: Experienced, Unexperienced and Naïve females, with 6, 1 and 0 mating sessions respectively; and the Supraphysiological group, with 6 sessions but primed with 10 μg of EB and 1 mg of P. Sexual behavior tests lasted 1h and Lordosis Quotient (LQ) was registered. After the 6th sexual behavior test, each group
was divided into 3 subgroups: Mating group, which received an extra mating session; Olfaction group, which was exposed to bedding from a male’s cage; and Control group, which was exposed to clean bedding. After 90 min, animals were euthanized and brains were processed for c-Fos immunohistochemistry. Our results showed that LQ of the first session of the supraphysiological group was low and indistinguishable from the other groups (p=0.457). Moreover, the Supraphysiological females showed a lower increase in their LQ over sessions. Sexual experience increases the activation of cells in the VMH, and decreases in the MPOA in inexperienced females. Exposure to male odorants increased cell activation in the AOB, but this increase was not seen when females mated. The exposure to male odorant also caused a reduced activation in the ACo. Our results suggest that although sexual hormones are needed to induce SR, the high levels of this behavior require some plastic change, as suggested by the changes observed in c-fos expression.

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89. EEG CORRELATES OF VERBAL WORKING MEMORY IN CHILDREN WITH LEARNING DISORDERS

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Working memory (WM) deficits are a main issue in children with learning disorders (LD), who also frequently show a slower electroencephalogram (EEG) resting-state activity than healthy children. The EEG is useful as well to examine the neural oscillations of cognitive processes. In this work, we examined the power spectrum and EEG connectivity of LD-children and control (Ctrl) children during the performance of a WM task. 19 LD and 21 Ctrl children responded to a verbal WM task: they had to remember 4 digits, in a light-load memory condition the digits were the same, in a heavy-load condition the digits were different. The EEG was recorded at 19 electrodes (10-20 system) referred to linked earlobes, and 800 ms samples corresponding to the retention phase of the task were selected. The current distribution was estimated with a source localization method (s-Loreta), and 18 brain regions of interests (ROIs) were selected with a principal component analysis. We analyzed the power spectrum at the 18 ROIs and employed an effective connectivity measure (isolated effective coherence) to find direct paths of information flow between the ROIs. Behavioral results: LD-children had fewer correct responses than Ctrl-children at the heavy-load condition. Power spectrum results: LD-children showed a slower EEG with more theta activity, and less high-frequency (beta and gamma) activity in frontal areas. Connectivity results: LD-children had fewer connections from the left frontal and temporal areas, and more connections from the right hemisphere. These results reveal a different electroencephalographic pattern in LD-children that could contribute to explain their WM deficits.

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90. ANALYSIS OF THE CEREBRAL CONNECTIVITY THAT UNDERLIES AUDIO-MOTOR INTEGRATION INDUCED BY SOUNDS WITH TEMPORAL STRUCTURE

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Music engages a distributed set of cortical modules that process different perceptual, cognitive and emotional components with varying selectivity (Warren, J., 2008). Angulo-Perkins, et al. (2014) through fMRI, found
that the planum polare (located in the anterior portion of the superior temporal gyrus) presents a greater activity while participants listened to music (as compared to listening to equally complex -albeit non-musical-acoustic stimuli), suggesting that this structure is a relay in the processing stream for musical or rhythmic stimuli, which receives information from the central regions and which integrates complex acoustic attributes. Wilke et al. (2015) found that the analysis of rhythmic structures requires the activity of the somato-motor regions, which are related to the motor theory of the rhythmic perception. The present research investigates functional connectivity that underlies the audio-motor network integration during resting state, and during listening to manipulated (rhythm) and intact music, between listeners with and without professional musical training. However, as a first step, we evaluated in how far the auditory cortices are functionally connected to motor areas during resting state (i.e., not listening to any stimuli). Using magnetic resonance images from the Human Connectome Project (HCP), we delineated 4 areas per hemisphere (planum polare, somatomotor area, precentral gyrus and postcentral gyrus) in a group of 50 healthy adults. Preprocessing, including slice time correction, motion correction with artifact rejection, spatial normalization, and smoothing with a 6 mm Gaussian kernel, were implemented with Functional Connectivity Toolbox (Whitfield-Gabrieli, et al, 2012; http://www.nitrc.org/projects/conn/). Correlation maps of seed regions (ROI to ROI analysis) were generated for each network. The correlations showed a significant positive correlation (p <0.001 in voxel and p <0.05 at the cluster level with FDR correction) between all the seed areas. Also, when we compared planum polare (seed region) with the other three areas (seed to voxel analysis), we found a significant positive correlation between all areas and seed region, but there was a bigger significance in the correlation between planum polare and precentral gyrus and post central gyrus.

Our results derived from an independent data set demonstrate the existence of a tight functional connectivity between auditory and motor areas in the resting state condition. We are now testing the hypothesis whether this connectivity is modulated during listening of rhythmic and non-rhythmic stimuli.

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91. BIOMECHANIC ANALYSIS OF ELEMENTARY SENSORIMOTOR PATTERNS IN VERTICALIZATION MANEUVERS.

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Neurohabilitation is a therapeutic diagnostic method use dearly in the first postnatal months and recommended mainly in infants exposed to pre and perinatal risk factors (IRF) for brain damage. Timely detection of childhood neurological damage is a priority activity in the context related to public health, since10% of this population shows development alterations in a transitory or definitive way with an incidence of neurological injuries (2 of 1000 live births). Such alterations can be detected early in the infant’s motor behavior through the exploration of the Elementary Sensorimotor Patterns (PES), from which develops: the incorporation into the sitting position, entrainment, crawling, standing and gait, prospectively pointing out development, these motor models are innate as well, stereotyped, with vestibular stimulation and cerebral organization at cortical level and basal ganglia. Biomechanics assess of PES in verticalization maneuver aims to quantify the differences in the reproduction of the movement between the IRF and a control group along the first 20 postnatal weeks. Four monthly evaluations were performed three times each maneuver, divided for the
analysis in the work period and the midline period. The IRF and control group showed significant differences in their production of PES in cycle time (15.9 + .6.9, 25 + .9.2), percentage of work period (70.4% + 16, 91.62% + 5.32) and midline period (29.6% + 16.5, 8.37% + 4.2), in fact, angular variables of head and trunk by maneuver were obtained showing significant differences between groups. It is possible to quantify the differences in their production of PES in both groups, which sets bases to consider as a diagnostic tool of quantitative variables mainly for the first postnatal weeks.

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92. WHERE IN THE BRAIN ARE SOCIAL REWARDS ENCODED?

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The study of how decisions are made is relevant from the economic and neurobiological standpoint. Behavioral and neurobiological studies can shed light on the factors that play a role in how people make choices. In decision-making studies, ventromedial prefrontal cortex (vMPFC) has been frequently reported as the neural signature of forced choice, and it is supposed to encode the differential value between the chosen and unchosen options of, mostly, monetary rewards. However, there is strong evidence that different types of decisions recruit distinct neural circuits, the neural region involved could vary depending on the kind of decision being made. To find out if the vMPFC encodes the differential value of different kinds of rewards, we used a modified version of the common-goods-game (behavioral paradigm) to induce the experience of social unfairness, and then we used functional magnetic resonance imaging (fMRI) during a two-option-forced-choice (2OFC) paradigm involving primary (chocolate), social (justice) and monetary rewards. We found that the behavioral paradigm selected did not result in the choice of social rewards for most participants. For those participants that selected all three kinds of rewards, we found greater activation in the vMPFC when comparing monetary versus social rewards, and monetary versus primary rewards. Importantly, we did not find greater activation for the contrast between primary versus social rewards. Even though our imaging results suggest that the differential value between social and primary rewards might not be encoded in the vMPFC, we decided that the behavioral paradigm should be adjusted to elicit desirability for every reward in every subject and confirm these preliminary findings. D

93. EVALUATION OF THE EFFECTS OF OLEAMIDE ON THE BEHAVIORAL AFFECTATIONS INDUCED BY STRESS

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The endocannabinoid system has been identified as important physiological component involved in the buffering and termination of stress response. Oleoylthanolamide or oleamide (OEA) is an endocannabinoid that has not been thoroughly studied in relation to stress and anxiety, as other endocannabinoids like anandamide (AEA) and 2-arachidonoylglycerol (2-AG). AEA and OEA both belong to the family of ethanolamides and can be degraded by the same enzyme, fatty acid amide hydrolase (FAAH). Considering FAAH inhibitors have emerge as a possible treatment for mood disorders and anxiety, it is important to elucidate the role of that OEA might play in these therapeutic effects. The general objective of this study was
to evaluate the preventive potential of OEA on behavioral alterations induced by the exposure to predator scent stress (PSS), an ecological model of acute stress. Three doses of OEA (1, 2 y 4 mg/kg) or vehicle were administered to male Wistar rats (N=32) 10 minutes before the exposure to the stressor. Twenty-four hours after PSS, stress-induced effects were measured with the elevated zero maze. A dose-dependent anxiolytic effect was observed, in which 1 mg/kg had a peak anxiolytic effect in the measures of open-arm duration and open-arm entries. It is important to clarify that the results observed were not dependent of pharmacological activity during the behavioral assessment, considering that oleamide has a short in vivo half-life of less than 30 minutes. Henceforth, the behavioral These results indicate that OEA can have preventive effect on stress-induced alterations and could be considered as a potential target for the treatment of stress-related psychiatric disorders.

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94. ANTIANDROGENS AND MOLECULAR IODINE TREATMENT ON PROLIFERATION OF HUMAN PROSTATE CANCER CELL LINES

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Prostate cancer is the most frequently diagnosed neoplasia in occidental men. In early stages, this disease is androgen dependent, hence in most cases, the therapeutic treatment involves the use of antiandrogens. Bicalutamide (Casodex®) and enzalutamide (Xtandi®) are selective antagonists for the androgen receptor; both are prescribed for the treatment of localized and metastatic prostate cancer respectively; however most of the treated patients develop a resistant state to antiandrogen treatment. On the other hand, molecular iodine (I2) induces antiproliferative and apoptotic effects in androgen-dependent (LNCaP) and -independent (DU145) prostate cancer cells. The antineoplastic mechanisms of I2 involve the generation of 6-iodoloactone (6-IL), which is produced by iodination of arachidonic acid. 6-IL acts as ligand of peroxisome proliferator activated receptor gamma (PPARγ). Bilateral interactions between PPARγ and androgen receptor have been shown on prostate cancer cells. The androgen receptor activation decreases PPARγ levels; and on the other hand, the activation of PPARγ through ligands like ciglitazone and prostaglandin PGJ2 inhibits the transcriptional activity of androgen receptor.

We propose that combination of antiandrogens and I2 synergistically will inhibit cell proliferation, by means of the activation of PPARγ and inhibition of androgen signaling. To analyze this hypothesis, we are analyzing the effects of bicalutamide and I2 on proliferation of LNCaP and DU145 cells. As expected, increased concentrations of bicalutamide (0.5 to 10 µM) inhibited the proliferation of LNCaP cells, showing a half-maximal inhibitory concentration at 1.0 µM. The time required to observe the inhibitory effect of bicalutamide was 96 hours. At these doses and times, bicalutamide had no effect on DU145 cells (androgen resistant). Ongoing studies analyze the combined effects of bicalutamide, enzalutamide and I2 on cell proliferation and on the levels of PPARγ and androgen receptors, as well as on their respective downstream effectors of cell arrest, apoptosis and proliferation (p53, p21, BAX, Bcl-2 and CCND1 pRb).

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95. WHITE MATTER ALTERATIONS IN HEAVY CANNABIS USERS

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Cannabis use has increased in recent years, as well as interest in the different mechanisms in which exposure leads to neural changes that affect diverse cognitive processes. Effects are primarily attributed to δ-9-tetrahydrocannabinol (THC), the main psychoactive ingredient in the plant, which binds to cannabinoid receptors. Specifically, although functional changes have been widely reported across cognitive domains in cannabis users, structural changes associated with marijuana use have not been consistent (Filbey, 2016. Jakabek, 2016). This study contributes with evidence about which brain areas may be compromised with high levels of marijuana consumption. We have explored the main white matter tracts using an MRI Technique called Diffusion Tensor Imaging (DTI), in which white matter integrity can be compared between groups.

Participants included 33 heavy marijuana users (at least 16 joints per month in the year previous to imaging) and 35 non-consuming controls; both age groups ranged from 18 to 40 year olds. Users reported marijuana as their main psychoactive substance of use. High resolution T1 weighted images were acquired in addition to 64 diffusion weighted images in a 3T MR scanner. Images were anonymized and processed using FSL’s Diffusion Toolbox and Tract Based Spatial Statistics. Further processing included selecting and analyzing the different tracts based on John Hopkins University Atlas.

Voxel-wise analysis of the whole white matter tissue using non parametric tests, showed no significant difference between groups. A linear model was also fitted including group, sex and age interaction as explanatory variables. Significance for each explanatory variable fit was defined as p<0.05 after correction for multiple comparisons (around 100,000 voxels) using the Threshold-Free Cluster Enhancement. Groups showed no significant differences in age nor sex proportions. However, when analyzing specific tracts individually, a significant difference was identified in the Left Inferior Longitudinal Fasciculus, Left Anterior Thalamic Radiations and bilaterally in the Hippocampal Cingulum. Our results support previous evidence suggesting that chronic exposure to cannabinoids has localized effects on specific brain areas which partake in specialized cognitive functions and involve neural maturation and development processes such as axon myelination.

Special thanks to M. en C. Leopoldo González Santos, Dr. Erick Pasaye Alcaraz and M. en C. Juan José Ortíz Retana for technical support. Research funded by: Conacyt (47428), PAPIIT (204217).

96. PSYCHOMOTOR DEVELOPMENT IN LOW BIRTH-WEIGHT PREMATURE INFANTS WITH NEUROHABILITATORY PROCEDURE

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Low birth-weight (LBW) is defined as less than 2,500 grams, and is associated with increased infant mortality and morbidity. Infants with LBW can be preterm (<37 gestational weeks), small for gestational age (SGA) or both. SGA is defined as a birth weight and/or length <2 standard deviations below the gender-specific
population reference mean for gestational age. Nevertheless, regardless of whether the child is born SGA, very preterm infants tend to be small at term, and a considerable proportion of them even meet criteria for SGA by that age. Those conditions could lead to a level of child malnutrition (LCM). Repercussions fall directly on the psychomotor development of the infant. Because of this, neurohabilitation treatment (NT) is used to prevent sequelae of perinatal brain injury. The aim of the study is to describe the relationship between birth-weight gestational age and psychomotor development in preterm infants who received NT. A sample of 96 preterm infants who received NT were chosen and classified into two groups: SGA and appropriate for gestational age (AGA). Each participant had a monthly nutrition assessment with the classification of corresponding malnutrition, as well as the weeks of consolidation of gross (GMM) and fine (FMM) motor milestones. The Mann-Whitney U-test was applied to compare the weeks of GMM and FMM consolidation between the two groups. No significant differences were found (p> 0.05). However, 72.2% of the SGA group showed an LCM, with a mild LCM predominating with 50%. Compared with 60.2% of the AGA group who maintained an LCM and 39.8% were able to normalize. Conclusions: This shows that despite the condition of LBW and the presence of an LCM, NT is exerting a positive effect on psychomotor development, since no significant differences were found in the weeks of consolidation of GMM and FMM in groups.

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97. CHARACTERIZATION OF THE ACTIVITY FRACTIONS DERIVED FROM CAPSICUM ANNUUM L IN MCF-7 AND MCF-12F CELLS


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Several physiological functions are influenced by Ca²⁺ signaling: hormone regulation, proliferation, apoptosis, protein and molecular mechanisms. Ca²⁺ concentration of the endoplasmic reticulum (ER) is crucial, depletion of Ca²⁺ levels induce an activation of plasma membrane Ca²⁺ channels which mediate influx of Ca²⁺ from the extracellular space into cells (SOCE: Store operated calcium entry). The dysregulation of Ca²⁺ homeostasis as an important event in driving the expression of the cancerous phenotypes. SOCE activation is involved in events such as proliferation, migration invasion and metastasis. On the other hand, the fruits of capsicum annuum L have compounds like ascorbic acid, phenolic compounds vitamins A and E, as well as, capsaicin analogues, with activities as antioxidant, anti-inflammatory and anticancer. Capsaicinoids are closely related to their ability to prevent cell proliferation, migration and to induce cell apoptosis. Therefore, the objectives of our study were to determine activity fractions derived from capsicum annuum L, to establish its role in cell proliferation and SOCE using MCF-7 and MCF-12F cell lines. In addition, we bioinformatics analysis of the gene expression profile in MCF-7 and MCF-12F cells indicates that Ca2+-dependent proteins are altered in both cells types, including TRPs, RyR and IP3R proteins and others proteins.

FOPER 2017 to JDRG/VMT, FOFIUAQ 2016 to CSG.
98. CHARACTERIZATION OF SPONTANEOUS RETINA ELECTRICAL ACTIVITY

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During mouse development, spontaneous electrical waves occur in the retina. It has been shown that three transient retinal circuits mediate these waves and that this spontaneous activity is necessary for the development of mouse retina neural network. We recently obtained evidence of spontaneous activity in human adult retina. Given that (i) alteration in the spontaneous electroencephalogram activity has been reported in patients with diabetes mellitus (DM) and (ii) chronic hyperglycemia induces neurovascular lesions in mouse and human retina, we propose that the mouse retina exhibits spontaneous electrical activity that is altered during diabetes. Furthermore, it is very important to elucidate the molecular mechanisms involved in the development of diabetic retinopathy (DR) since the actual treatments for DR, laser photocoagulation, vitrectomy and anti-VEGF intravitreal injections are not 100% effective and they may lead to loss of acuity and visual field. In this line, blockade of the transient receptor potential vanilloid 4 (TRPV4) channel seems to be a good molecular therapeutic target for DR because TRPV4 knockout mice do not develop insulin resistance during high fat diet-induced obesity and we and others found TRPV4 expression throughout mouse retina. Our aims therefore consist in recording spontaneous electrical activity in mouse retina, determining if insulin resistance associates with a reconfiguration of the circuit of spontaneous retinal activity in obese mice, and to test whether the absence of TRPV4 channels protects against the reconfiguration of the retinal circuit induced by obesity using TRPV4 knockout mice. Up-to-date, we were able to record spontaneous activity in C57BL/6 mouse retina through the electroretinogram technique. This activity happened under both photopic and scotopic conditions. Additionally, we measured overweight, insulin resistance, and glucose intolerance in mice fed a high fat diet for 6 weeks. We are now in conditions of fulfilling our second and third aims.

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99. HYPERPROLACTINEMIA LEADS TO ELEVATED LEVELS OF PROLACTIN IN THE VITREOUS OF PATIENTS WITH DIABETIC RETINOPATHY

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Diabetic retinopathy (DR) is a major microvascular diabetic complication characterized by excessive vasopermeability and the formation of new blood vessels (angiogenesis) that can lead to retinal detachment and blindness. Preclinical studies show that the hormone prolactin (PRL) accesses the retina from the systemic circulation where it is proteolytically cleaved to vasoinhibins, a family of PRL fragments that inhibit ischemia-induced retinal angiogenesis and diabetes-derived retinal vasopermeability. Therefore, medications causing hyperprolactinemia have therapeutic potential in DR. Levosulpiride is a dopamine D2 receptor antagonist effective for inducing hyperprolactinemia used in diabetic patients due to its prokinetic effects. In this study we investigated whether the oral administration of levosulpiride elevates PRL levels in the vitreous of volunteer patients with DR undergoing medically prescribed vitrectomy. PRL was measured by immunoassay (IMMULITE 2000 XPi). The treatment with levosulpiride (25 mg, 3 times a day) was for 7 days ending on the day of vitrectomy. Levosulpiride elevated circulating (111.7 ± 12.51 vs 10.08 ± 1.46 ng
/ ml, p <0.0001) and vitreous (3.59 ± 0.45 vs. 1.65 ± 0.26, P <0.0008) levels of PRL compared to placebo treatment. PRL levels in the vitreous correlated directly (r = 0.56, R² = 0.3140, p <0.05) with the circulating levels of PRL in the whole study population (16 patients treated with placebo and 15 with levosulpiride). These results show for the first time the presence of PRL in human vitreous and the incorporation of systemic PRL into the eye of patients with DR. In-process studies are evaluating vitreous levels of vasoactive mediators known to influence DR. Our work is consistent with the use of levosulpiride to elevate intraocular PRL as potential treatment for DR.

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100. REPETITIVE TRANSCRANIAL MAGNETIC Stimulation (rTMS) IN OBSESSIVE COMPULSIVE DISORDER PATIENTS. PRELIMINARY REPORT

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Background. Repetitive Transcranial Magnetic Stimulation (rTMS), at 1 Hz, over the Supplementary Motor Area (SMA) has been suggested as a treatment for Obsessive Compulsive Disorder (OCD); however, there is still no consensus on the best rTMS protocol for treating OCD.

Objective. To explore whether the rTMS protocol used in this investigation significantly decreases the symptoms of OCD.

Participants. 5 patients with OCD (3 women), aged 22-42 years (mean = 27.8, SD=8.3), 3 under treatment with Selective Serotonin Recapture Inhibitors (SSRIs), and 2 without treatment. All patients with an average intelligence quotient.

Methods. The diagnosis of OCD was confirmed by a specialist in Psychiatry. The severity of OCD symptoms was determined using the Yale-Brown Scale (YBS). The Hamilton Scales for Depression (HDS) and Anxiety (HAS) were also used. An electroencephalogram was performed to rule out the presence of abnormal paroxysmal activity. The applied rTMS protocol consisted of: stimulation of the SMA (5% of the distance between nasion and inion, ahead of Cz (according to 10-20 System), at 1 Hz, 15 sessions, each of 1800 pulses, divided into 3 trains of 600 pulses each, with an inter-train pause of 30s, using 100% of the motor threshold.

Results. The effect size (ES) of the rTMS therapy was analyzed, by calculating the Cohen’s d. The ES average was 0.40 (≤ 0.3, ES small; 0.5, ES medium) for YBS and medium (ES=0.56) for HDS and HAS, respectively.

Conclusions. The reduction of cortical excitability produced by rTMS (1 Hz) on SMA seems to be useful for decreasing OCD symptoms, as well as for improving comorbid symptoms of depression and anxiety. This is the first protocol reported with these characteristics and although their results are encouraging they should be validated with a larger sample.

101. VASOINHIBINS ARE PROINFLAMMATORY IN SYNOVIAL FIBROBLASTS AND ARE GENERATED IN MICE TREATED WITH PROINFLAMMATORY CYTOKINES OR SUBJECTED TO ANTIGEN-INDUCED ARTHRITIS

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Vasoinhibins are a family of peptides with antiangiogenic and pro-inflammatory effects that are generated by the proteolytic cleavage of the hormone prolactin (PRL). Proinflammatory cytokines mediate inflammation in arthritis and stimulate the production and action of proteases able to cleave PRL to vasoinhibins. Here, we investigated whether vasoinhibins contribute to inflammation in arthritis by examining their proinflammatory effects on primary cultures of synovial fibroblasts and their generation in mice treated with proinflammatory cytokines or subjected to antigen-induced arthritis (AIA). Vasoinhibins increased the expression of the proinflammatory cytokines and inflammatory mediators: tumor necrosis factor α (TNFα), interleukin 1β (IL1β), interleukin 6 (IL6), interferon γ (INFγ), inducible nitric oxide synthase (iNOS), and matrix metalloprotease 3 (MMP3). The effects were dose-dependent and blocked by the NFκB inhibitor, BAY 11-7082. PRL cleavage to vasoinhibins was increased after incubating PRL with extracts from synovial fibroblasts treated with cytokines (Cyt: TNFα, IL-1β, and IFNγ) or extracts from arthritic joints. Mice null for the PRL receptor (Prlr-/-) are hyperprolactinemic and the higher levels of the substrate (PRL) in these mice could help amplify detection of its proteolytic conversion to vasoinhibins in arthritis. We found that the intra-articular injection of Cyt into the tibio-femoral joint or induction of AIA increased the levels of systemic vasoinhibins in both, Prlr-/- and Prlr+/+ mice as revealed by the immunoprecipitation-Western blot analysis of serum samples. We suggest that vasoinhibins are generated and may contribute to inflammation in arthritis.

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102. BRAIN FUNCTIONAL CONNECTIVITY CORRELATES OF MUSIC-INDUCED ANALGESIA IN FIBROMYALGIA

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Music reduces pain in fibromyalgia (FM), a chronic pain syndrome that predominantly affects women, of unknown etiology, characterized by increased sensitivity to somatosensory nociception, and associated with other symptoms such as sleep disorders, stiffness, fatigue, anxiety, and depression. In this study, we explored the neural correlates of music-induced analgesia (MIA) in FM patients (n=20, age range=22-70, mean=46.4, SD=12.5), compared to age and sex-matched healthy controls (HC) (n=20, age range=21-70, mean=42.1, SD=12.5). Behavioral measurements and functional connectivity (FC) results of resting-state functional magnetic resonance imaging (rs-fMRI) were compared between groups. We performed seed-based correlation analyses (SCA) between each of the areas related to the so-called experimental pain
neural network (e-PNN) and the rest of the brain, and compared the connectivity maps between FM patients and HC, to find about the acute effects of a music intervention. Pain intensity (PI) and pain unpleasantness (PU) were measured immediately before and after each experimental condition, which consisted of two auditory stimuli: music and pink noise (control). Music was familiar, participant-chosen, pleasurable and slow paced. FM patients showed higher pain catastrophizing (p<0.001), pain self-perception (p<0.001), anxiety (p<0.001), and depression (p<0.001) symptoms than HC. FM patients reported less pain intensity (W=60, p=0.002) and unpleasantness (W=65.5, p=0.004) after listening to music, and not after listening to the pink noise. FM patients showed a disrupted FC of the e-PNN, when compared to HC. FM patients showed a significant effect of the music on the FC of the e-PNN. MIA in FM was negatively correlated to FC decrease between angular gyrus, posterior cingulate cortex and precuneus, and positively correlated to FC increase between amygdala and middle frontal gyrus. These areas are related to autobiographical and limbic processes, and auditory attention, suggesting that these seeds could represent relevant areas of the e-PNN at rest, that may also be involved in the analgesic effect produced by music listening. The characteristics of the music intervention appear to be important elements for producing a significant analgesic effect, by a top-down modulation, probably originated by distraction, relaxation, positive emotion, or a combination of these mechanisms.
103. EFFECTS OF CHRONIC EXERCISE IN THE MOUSE MODEL FOR ALZHEIMER’S DISEASE (3xTg-AD)

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Alzheimer’s is the most common type of dementia, in older adults and in advanced stages affect motor functions and thus their autonomy. Associated to these functional changes, there are accumulation of β-amyloid peptide (βA) and formation of intracellular neurofibrillary tangles in brain regions that regulate motor function. It has been reported the benefits of exercise on the cognitive function, and on experimental animals it is shown that exercise and / or enviromental enrichment can help. The cholinergic system is altered in Alzheimer’s with the decrease of the enzyme choline Acetyltransferase (ChAT) and reduction in the number of cholinergic neurons in the basal nucleus of Mayner (NBM). The cellular mechanism of Alzheimer’s is studied in the triple transgenic mouse (3xTg-AD) which overexpress the 3 human proteins (PS1M146V, APPSWE and TauP301L). This work, was designed in males 3xTg-AD of 12 months of age, subjected in an exercise treatment for 2 and 4 months. Six experimental groups were divided into: two of 3xTg-AD (Tg) and two non-transgenic (NTg), compared with their respective sedentary groups (Tg and Ntg). In groups with exercise, the motor test associated with the stride during walking was related with immohistochimical analysis for ChAT and Aβ in three brain areas (NBM, motor cortex and subiculum). The results show changes in the length of the stride during walking and it is observed that among the sedentary Tg and Ntg mice there is no difference, but if there are significant changes in mice subjected to treatment of exercise for 2 months compared to sedentary groups. In NBM, the enzyme ChAT, increased in those groups treated with the exercise of 2 and 4 months, compared with sedentary Ntg, but a reduction of βA in the motor cortex and the subculum were found in comparison with the sedentary group Tg. These data suggest the beneficial effect of physical exercise on Alzheimer’s disease, because there is an efficient motor displacement and is related to the increase of cholinergic cells in the NBM, in addition to causing a delay in the occurrence of the aggregation of βA protein in the motor cortex and subiculum.

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104. EXPRESSION AND RELEASE OF GROWTH HORMONE IN B LYMPHOCYTES OF THE CHICKEN BURSA OF FABRICIUS

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Growth hormone (GH) is expressed in the immune system acting as a cytokine. It is now accepted that GH exerts homeostatic and immunomodulatory effects at cellular and humoral levels. Our experimental
model are isolated cells from the bursa of Fabricius (a primary immune organ), in which 90% of the cells are immunoreactive for CHB16 protein, an exclusive marker for avian B lymphocytes. In addition, GH mRNA and protein, and its receptor (GHR) are expressed in these cells. It is known that GH promotes survival in bursal B lymphocytes by decreasing the caspase-3 activity leading to a reduction of apoptotic cells. The aim of this study is to determine if the GH produced in bursal lymphocytes is regulated by classical hypothalamic hormones. We analyzed the effect of growth hormone releasing hormone (GHRH), thyrotropin releasing hormone (TRH), ghrelin and somatostatin (SST) upon the GH mRNA expression and release in bursal lymphocytes. Bursal cells were incubated with 3 concentrations of each hypothalamic hormone (1, 10 and 100 nM) for 1 h. Cells were separated from culture media and the expression of receptors of GHRH, TRH, ghrelin and SST was determined by RT-PCR. The GH mRNA was quantified by qPCR, and the intracellular GH and pCREB was determined by SDS-PAGE-WB. Cell culture media was concentrated and the release of GH was determined by SDS-PAGE-WB. TRH-R, GHR1a and SSTR1-5 were expressed in B lymphocytes whereas GHRH-R was not detected under our experimental conditions. GH mRNA expression significantly increased with TRH (10nM), and decreased with SST (1 and 10nM) whereas ghrelin had no effect. The intracellular content of GH in cells treated with GHRH, TRH, ghrelin and SST did not show a significant change. In relation to GH released in media culture, GHRH and ghrelin did not show changes on the release, however, TRH and SST showed and inhibitory effect upon release. Incubations with TRH (10nM) increased the phosphorylation of CREB. These results suggest that the expression and release of GH in B lymphocytes is differentially regulated in comparison with the pituitary.


105. NEURAL BASIS OF BIMANUAL COORDINATION

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Many of our daily movements require bimanual control, typing on a keyboard, tying the shoelace or using the cutlery; their accuracy execution requires spatial and temporal coordination. Previous evidence has shown that sensorimotor cortex (M1/S1) is involved in bimanual movements and provides broad bilateral projections to its counterpart and to the striatum, however, the role of sensorimotor projections in bimanual coordination remains unclear. In this context, our working hypothesis is that the striatum receives bilateral information from sensorimotor cortices and integrates it to coordinate motor commands during bilateral movements. Our aim is to identify the role of ipsi- and contra-lateral corticostriatal projections in bimanual coordination. For this purpose, we created a bimanual coordination task for rats, where kinematic parameters of coordinated bimanual movements can be accurately quantified. In this task, rats learned to vertically displace two independent levers at least 3 cm (spatial component) at the same time (temporal component) to obtain a reward. We found that rats naturally develop coordinated bimanual movements, with highly spatially and temporally correlated trajectories. Unilateral striatal lesions cause slowness of the contralateral paw and consequently spatial and temporal uncoupling. Further analysis will clarify if the striatum is required for executing a coordinated motor output or if it only provides kinematic control. Ongoing optogenetic experiments in anesthetized rats indicate that both, unilateral photoactivation/photoinhibition of sensorimotor cortex modify the neuronal activity in the contralateral cortex. These preliminary results suggest that optic manipulations of the activity of cortical sensory-motor projections to the contralateral cortex and the striatum...
are possible in unrestrained conditions. Future experiments using the same technology in freely moving animals executing bimanual movements will help us to unravel the participation of these specific circuits. PAPIIT: IA201916, CONACyT-CVU: 619506

106. ANALYSIS OF SERUM PROLACTIN LEVELS IN ASSOCIATION WITH PARAMETERS OF THE METABOLIC SYNDROME IN HUMANS


The Metabolic Syndrome (MS) is a set of pathophysiological disorders that include: abdominal obesity, high triglyceride levels, low high dense lipoprotein (HDL) cholesterol, hyperglycemia, and high blood pressure. The diagnosis of MS is given when at least 3 of these alterations are present. Low circulating levels of the hormone prolactin (PRL) are associated with increased prevalence of insulin resistance, glucose intolerance and type 2 diabetes in humans. Moreover, our work group has shown that in rodents PRL treatment improves insulin sensitivity and adipose tissue functionality under obesity conditions. Since adipose tissue dysfunction and insulin resistance are considered as early events towards the development of metabolic alterations derived from obesity, in the present project we proposed to investigate whether circulating PRL levels are a biomarker of metabolic syndrome features. Clinical and biochemical parameters were evaluated in male and female subjects recruited at the General Hospital of Querétaro. When dividing subjects according to their Body Mass Index, no significant changes were found in insulin resistance, glucose, insulin or serum PRL levels. When participants were classified according to their sensitivity to insulin in sensitive (IS) or resistant (IR), participants with IR had lower concentrations of serum PRL, as well as tendencies towards higher levels in triglycerides, blood pressure, glucose, HDL and larger waist circumference. When participants were grouped according to their PRL levels in higher and lower, insulin levels and insulin resistance were significantly higher in the group with lower PRL. Also, there were trends towards lower triglyceride and glucose levels in subjects with higher PRL. In summary (although the number of participants will increase to have a larger sample), so far our results support that PRL plays an important role in insulin sensitivity in humans, and that this occurs independently of other parameters of the metabolic syndrome.

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107. THE USE OF EMPIRICAL MODE DECOMPOSITION FOR THE IDENTIFICATION OF THE HEMODYNAMIC RESPONSE OF THE VISUAL CORTEX IN NEWBORNS WITH INTRAUTERINE GROWTH RESTRICTION

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Background: The functional Near-infrared spectroscopy (fNIRS) is a noninvasive technique that can identify the regional hemodynamic response of the cerebral cortex. However, signals obtained through fNIRS contain
physiological components and movement artifacts that do not correspond to the hemodynamic activity of the brain cortex. Different types of filtering have been used to remove these artifacts with not optimal results. **Objective:** To use the Empirical Mode Decomposition (EMD) to eliminate unwanted components and identify hemodynamic response in newborns who were diagnosed with intrauterine growth restriction (IUGR) during fetal life.

**Methods:** A total of 12 newborns of both sexes who were diagnosed with IUGR stage-I in the Unit of Fetal Surgery were included. Twelve channels of near infra-red monitoring system (Hitachi ETG-4000) were used to obtain the regional hemodynamic response over the occipital cortex when the neonates completed 43 weeks of postmenstrual age; A stimulation paradigm with stroboscopic light flashing during 10 seconds and rest periods of 40 seconds repeated 8 times during spontaneous sleep was presented. The signals of oxyhemoglobin were decomposed by EMD and recomposed using only the components without high instantaneous frequencies.

**Previous results:** The unwanted components of high instantaneous frequency and trend were eliminated and all 12 cases showed a positive hemodynamic response in oxyhemoglobin, at least, four channels with a maximum amplitude of 0.058 m(mol / ml)xmm and a latency of 15.8 seconds.

**Conclusion:** For the moment, this previous results suggest that EMD is suitable for processing hemodynamic signals in newborns as other authors have suggested in adults.

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**108. PHYSIOTHERAPEUTIC TREATMENT EFFECTIVENESS IN STRENGTH AND POSTURE CHANGES IN PATIENTS WITH SPINAL CORD INJURY**

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**Introduction:** A spinal cord injury is defined as any alteration of the spinal cord which represents a huge disability problem as it affects partial or total motor, sensitive and vegetative functions depending of the lesion level. The prevalence of patients with spinal cord injury in Mexico is around 18.1 per million per year with a 6:1 male/female ratio of medullar injury affecting motor independence.

**Objective:** To measure the effectiveness of treatment of independence degree and functionality in patients with spinal cord injury.

**Methods:** A sample of 8 patients with a diagnosis of complete spinal cord injury was submitted for treatment protocol in a three-month period. The frequency consisted of two hours, three times per week in each therapeutic session. The evaluations were conducted at the beginning and at the end of the treatment with Daniel’s scale in muscular strength assessment, SCIM scale, which considers self-care, breathing and sphincter function and mobility. The data was analyzed with non-parametric Wilcoxon test and p≤0.05 was established as a significate value.

**Results:** We found changes in strength measures in muscle groups of right shoulder extensors and adductors (p=0.029), improvement in flexors, extensors and adductors (p=0.029) for the left shoulder, trunk (p=0.003), the lower limbs showed improvement in right hip adductors (p=0.029) and abductors (p=0.15), as well in left hip adductors (p=0.015). In the SCIM scale, mobility (p=0.003), breathing and sphincter control (p=0.008)
scores were found with favorable improvements. Finally, the posture changes \((p=0.005)\) registered a better score.

**Conclusion:** The improvements made show the effectiveness of the treatment as there is an increase in strength as well as the capacity of postural changes the patients presented; in turn, it allows independence and an increase in functionality of each patient.

109. PROLACTIN PROTECTS NEURORETINAL FUNCTION AND VASCULAR STABILITY IN DIABETIC MICE

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The diabetic pandemia requires new approaches to understand the pathophysiology and improve the detection, prevention, and treatment of diabetic retinopathy (DR), the cause of blindness in diabetic patients. The pathogenesis of DR includes glucose-mediated neuronal alterations and microvascular damage in the retina. Mechanisms of vascular injury comprise increased microvascular permeability and occlusion leading to ischemia-induced angiogenesis. The hormone prolactin (PRL) is a neurotrophic factor protecting against neuronal cell death and dysfunction in the continuous light-exposure model of retinal degeneration. Also, PRL protects against DR via its proteolytic conversion to vasoinhibins, a family of PRL fragments that inhibit ischemia-induced retinal angiogenesis and diabetes-derived retinal vasopermeability. Here, we used 18-week diabetic mice treated with multiple low-doses of streptozotocin (STZ) to evaluate the electroretinogram (ERG) under hyperprolactinemic conditions. Also, we determined diabetes-induced retinal vasopermeability in 24-week diabetic mice that were null \((Prlr^-)\) or not \((Prlr^+\)) for the PRL receptor. Hyperprolactinemia \((>30 \text{ ng/mL})\) induced by treatment with the dopamine type 2 receptor antagonist, sulpiride, prevented the diabetes-mediated reduction in the B-wave of the ERG but had no effect in non-diabetic controls. Retinal vasopermeability evaluated by the Evans Blue method increased two-fold in diabetic mice and such increase was significantly higher \((p<0.03)\) in \(Prlr^-\) mice compared to \(Prlr^+\) mice. Genetic deletion of the PRL receptor may have prevented the incorporation of systemic PRL into the eye, thereby blocking its ocular conversion to vasoinhibins and favoring excessive retinal vasopermeability. Our findings support the protective influence of systemic PRL on retinal tissue and the potential therapeutic effects of drugs inducing hyperprolactinemia in DR.

We thank Fernando López-Barrera, Martín García, Alejandra Castilla, Gabriel Nava, Daniel Mondragón, and Antonio Prado, for their technical assistance. Research was supported by CONACYT grant 247164.

110. COMBINING MULTITENSOR AND CONSTRAINED SPHERICAL DECONVOLUTION MODELS TO IMPROVE DIFFUSION WEIGHTED IMAGING TRACTOGRAPHY IN CHILDREN DURING THE SECOND YEAR OF LIFE

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**Background:** The limitations of the single tensor model for tractography have been thoroughly demonstrated in the literature, regarding fiber crossing regions and branching, as they exist in the corticospinal tract (CST). However, the use of the principles of the tensor model have not been lost yet, since they provide diffusion parameters not to be found on models like constrained spherical deconvolution (CSD). The use of CSD
allows for a more exhaustive illustration of fibers in tractography, with the implicit risk of spurious fibers being computed. In 24 month old subjects, any given tract can be misestimated due to existing structural anomalies or a preexisting pathology. This is due to partial volume effects caused by anisotropic voxel size. This work focuses on combining properties from two models – multi-tensor and CSD, to help the multi-tensor model increase its descriptive capabilities, while avoiding the computation of spurious fibers to a better extent. Due to the advantages the tensor model provides, we assume this approach helps in making a more realistic computation of fibers.

**Objective:** Improve the quality of CST tractography in diffusion weighted images (DWI) of children 2 years of age or younger, through a combination of the orientation distribution function (ODF) and tensors.

**Methods:** We analyzed a longitudinal study of children 12, 18 and 24 months old of corrected gestational age (n=5) using DWI with 35 directions and a value of b=1000. We reconstructed the CST from 2 region of interest, placed in the posterior limb of the internal capsule, as well as the pons. Afterwards the ODFs and the tensors are computed, the ODF is deconvoluted and its maxima extracted to fit it within the tensors. Finally, the multi-tensor + ODF is used to calculate the CST, as well as with a normal multi-tensor and CSD approach.

**Results:** The DWI of the subjects (n=5) show a similar pattern as the tracts computed with CSD (p<0.05), with less spurious fibers, yet with a clearer tract than the normal multi-tensor model.

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**111. DEHYDRATION-INDUCED ANOREXIA INCREASES MICROGLIA DENSITY IN THE RAT PREFRONTAL CORTEX**

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Anorexia nervosa is an eating disorder characterized by restrictive caloric intake that induces profound weight loss. The neurobiology of this disorder is unknown but magnetic resonance imaging studies reported functional and structural alterations in the prefrontal cortex of anorexic patients. Recent studies in murine models of anorexia suggest that glial cells deficits may be linked to alterations observed in patients. Glial cells are the major group in the brain and cytokines such as interleukin 6 (IL-6) and tumor necrosis factor alpha (TNFα) are released by microglia during neuroinflammation. However, whether anorexia affects microglia is unknown. Thus, the aim of this study was to test if microglia of the prefrontal cortex is affected by dehydration induced anorexia (DIA).

**Methods:** Three independent experimental series of nine female Wistar rats (180-200g) per group were used for this study: a) Control: received food and water *ad libitum*, b) DIA: received a saline solution (2.5 % NaCl) and food *ad libitum*, c) Forced Food Restricted (FFR) group received water and the same amount of food as the DIA group. Body weight and food intake were monitored daily for 5 days. Subsequently, the rats were sacrificed, brain tissue sections (30 μm) were obtained for immunofluorescence studies with the microglia marker Iba-1. The density of microglia was estimated for the three experimental groups. Western blot studies tested if TNFα and IL-6 expression were affected by anorexia.

**Results:** Microglia density was significantly increased (171 %) in medial prefrontal cortex and orbital prefrontal cortex (168 %). Likewise, in these regions the density of reactive microglia was significantly increased (≈ 263 %). However, microglia density was not significantly affected in the secondary motor cortex. Additionally, Western blots showed that anorexia increases the expression of the TNFα and IL-6 (198 % and 185 %). We conclude that DIA increases microglia density and the expression of TNFα and IL-6 in the prefrontal cortex.
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112. PHYSIOPATHOLOGICAL REGULATION OF THE PRL/VI AXIS ON THE NEUROVASCULAR UNIT AND BLOOD-BRAIN BARRIER

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Vasoinhibins (Vi) are fragments of the prolactin hormone (PRL) that inhibit angiogenesis, vasodilation and vasopermeability. The generation, secretion and regulation of Vi are part of the PRL/Vi axis, these hormones present opposing actions on the vascular system (angiogenesis/anti-angiogenesis) and in the Central Nervous System (anxiolytics/anxiogenic), exerting direct actions on neurons, glial and endothelial cells. The purpose of this project is to investigate whether the PRL/Vi axis participates in the pathophysiological regulation of the neurovascular unit, particularly in the regulation of blood-brain barrier (BBB). An in vitro model of BBB will be implemented from primary cultures of endothelial cells (MBEC) and astrocytes. The first objective was to obtain a primary culture of endothelial cells from brain cortex of 5-week-old male CD-1 mice. The characterization of the endotelial cells was performed by immunocytochemistry for CD31, and the purity was established by GFAP and NG2 (markers for endothelial cells, astrocytes and pericytes respectively) positivity. Also, these same markers were quantified by real-time PCR.

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113. STRUCTURAL ANALYSIS OF VASOINHIBINS: A MOLECULAR DYNAMIC SIMULATION APPROACH

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Vasoinhibins are endogenous angiogenesis inhibitors and potential agents for anticancer therapies. These peptides are generated when the hormone prolactin (PRL) loses its fourth α-helix (H4) by proteolysis. The newly acquired properties are restricted to vasoinhibins, which suggest that conformational changes occur and new bioactive domains are created upon PRL proteolysis. However, the structure of vasoinhibins is unknown. The aim of this study was to understand how PRL folds into vasoinhibins after the loss of H4, using a molecular dynamics (MD) simulation approach. We found that the lack of H4 exposes the hydrophobic nuclei of PRL, leading to a rapid collapse into a three-helix bundle, burying the hydrophobic nuclei again. This compression largely occurs by a major movement of the loop1 (L1), which stabilizes into a new conformation, while the rest of the molecule exerts only minor changes. Consequently, some residues in L1 modify their
surface exposure, resulting in a modification of the electrostatic and hydrophobic surface potentials, which may represent a vasoinhibins bioactive domain. This study provides insights into the structure of vasoinhibins that may help to understand its structure-function relationship, develop a vasoinhibins quantitative assay and new agonist and antagonist drugs.

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**114. STRUCTURAL AND ELECTROPHYSIOLOGICAL ANALYSIS OF CEREBELLAR CELLS FROM THE ROOF OF THE FOURTH VENTRICLE**

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**Introduction.** The cerebellum is the main center of motor coordination of the central nervous system and is involved in cognitive-emotional processes. It is composed of ten lobes (I-X), and lobe X forms part of the roof of the fourth ventricle. Little is known about the cellular organization of this region and recent findings indicated the existence of diverse cellular phenotypes. The aim of this study was to determine the cellular organization of this zone and to determine their electrophysiological characteristics.

**Material and Methods.** Cerebella from P50-P60 mice were processed by the Golgi-Cox technique, electrophysiological recordings were performed by whole-cell patch-clamp and biocytin was microinjected to reveal the morphology of cells.

**Results.** Golgi-Cox staining revealed three main cell types: 1) cells located in the lateral region with elongated soma (70 ± 5 μm), long processes (340 ± 46 μm) projecting towards the middle region and processes (162 ± 33 μm) that extend ventrally; 2) stellate-soma cells (89 ± 8 μm) with long lateral processes (322 ± 50 μm) and one ventricular projection (151 ± 7 μm); 3) small-soma cells (31 ± 7 μm) with two processes (116 ± 24 μm, 77 ± 21 μm) projecting ventrally and one short lateral process (50 ± 38 μm).

Electrophysiological recordings revealed 1) two cell populations regarding membrane resistance: a) 40-50 MΩ, and b) 18-20 MΩ. 2) Three types of passive responses, corresponding most probably to glial cells. Biocytin showed that these cells have the following characteristics: 1) cells located laterally have a soma of 20-25 μm, short projections and one long process that projects laterally; 2) small-soma cells (5-8 μm) with two long processes projecting laterally; 3) small-soma cells (8-10 μm) with multiple projections extending transversely towards the middle region.

**Conclusions.** A partial characterization of the cellular organization of the roof of the fourth ventricle showed a morphological and electrophysiological diversity of glial cells. The results provide valuable information, representing new areas of study that may be involved in specialized functions that are still unknown.

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115. DIFFERENTIATION EFFECT OF MOLECULAR IODINE IN MAMMOSPHERE CULTURE OF BREAST CANCER CELLS

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Mammary carcinoma is the malignant tumor with the highest incidence worldwide. In recent years several studies have focused on improving the conventional chemotherapeutic treatment by using natural molecules to limit chemo-resistance and avoid significant increases in toxicity. Molecular iodine (I2) is a chemical form of iodine that exerts significant antineoplastic effects on several cancer cells, and whose actions could be mediated by the induction of cell differentiation mechanisms. Many theories try to explain the way carcinogenesis arises and progresses. Among them, cancer stem cells (CSC) theory proposes that only the stem cells present in the adult tissue, after converted into carcinogenic cells, possess tumor-initiating properties and metastatic potential. Putative CSC has been described and characterized in breast cancer, where the CD44 and CD24 surface markers have been used to identify this population. Moreover, In vitro mammary cancer cells cultured under serum-free and non-adherent conditions, lead the formation of spheroid cell clusters called mammosphere, highly enriched in CSC. On the present work, we used this approach to evaluate the effects of I2 in breast CSC. Results showed that I2 supplement was accompanied by a decrease in cell proliferation in CSC and it also impairs mammosphere formation in a dose-response manner. Cytometric analysis revealed that mammosphere culture exhibited a dominant CD44+/CD24+ (luminal breast cancer model; cell line MCF-7) or CD44+/CD24- (luminal breast cancer model; cell line MDA-MB-231) sub-population and that I2 supplement exerted a differential selection through the CD44-/CD24- phenotype in both cases. Moreover, In vivo (Xenografts) and In vitro (Wound-healing assay and Transwell chamber) studies showed that I2 decrease the tumorigenic and invasive capacity of the CSC. All these results suggest that I2 has antiproliferative effects in breast CSC by forcing their differentiation into a less tumorigenic and invasive phenotype.

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116. EASY-TO-USE SOFTWARE TO EVALUATE HEART BEATING FROM ZEBRAFISH VIDEOS

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Danio rerio became a very convenient model organism to generate transgenic lines of a wide variety of genetic diseases, his transparency is one of the main advantages to visualize in vivo the effects occurring inside the fish without sophisticated equipment. Heartbeat is one of the parameters most extensively used to evaluate the effect of chemicals and phenotypes that affect cardiac function from specific genetic manipulations. In our particular interest, we will generate transgenic fish lines to study epilepsy in which cardiac arrest and arrhythmia are often observed. Some methods have been described to assess cardiac functions and commercial software is also available with a considerable cost. Additionally, some of these methods are limited by the requirement of using specific strains like GFP-strains or Casper. We designed easy-to-use software to measure zebrafish heart beating from videos. Using MatLab scripting language we designed a graphic interface to visualize and count heartbeat from video. Gray-scale images were used to determine diastole and systole, on the other hand cardiac frequency was measured according to the gray-scale oscillations. Our software also yields the area of each beat to detect potential arrhythmia. We validated
our software by a linear correlation between visual-inspection and software-obtained beat counting, we also
determined the minimum time of video analysis to obtain reliable results. We are now using the software to
analyze heart rate in experiments with zebrafish embryos and larvae in different media and developmental
stages. Currently we are exploring more applications of our software as well as its use for academic purposes.
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117. PRETERM BIRTH AND DIFFICULTIES IN VISUAL AND AUDITORY ATTENTION

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Preterm birth has been related with sensory, motor and cognitive difficulties. Preterm infants have lower
performance in selective attention, sustained attention, and divided attention compared to full- term-born
infants. In addition, premature infants are 4 times more likely to present Attention Deficit Hyperactive Disorder.
The objective of the present study is to compare the development of visual and auditory attention at 4 and
8 months of age between full term-born infants and premature infants who attend Neurohabilitation therapy.
Method: 60 infants of 4 and 8 months old participated. The Selective Attention Evaluation Scale (EEAS)
was used. Results: at 4 months of age, infants born at term have a greater number of correct responses in
auditory attention compared to preterm infants. Surprisingly, at 8 months, preterm infants present the highest
number of correct responses in visual attention. Conclusion: Although at 4-month-old premature infants have
a worse performance in the auditory attention, the 8-month-old infants who attended the neurohabilitation
therapy improved their visual attention. We consider that a complete evaluation of the attention process in
the first months of life is indispensable especially in those children with risk factors for brain damage.
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PhD. Antonio Fernández Bouzas.

118. THE CHRONIC EXPOSURE TO ATRAZINE CAUSES ALTERATIONS IN STRIATAL AND
MESECEPHALIC LEVELS OF GAMMA-AMINOBUTYRIC ACID (GABA), GLUTAMINE AND GLUTAMATE
IN THE RAT

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Atrazine (ATR) is an herbicide widely used to kill annual grasses and broadleaf weeds in crops like corn,
sorghum and sugarcane. Studies in rodents have shown that ATR exposure is associated with alterations in
the nigrostriatal dopaminergic pathway such as increased locomotor activity, decreased striatal dopamine
levels, and diminished numbers of tyrosine hydroxylase positive cells in substantia nigra pars compacta.
However, the effects of ATR on other neurotransmitters such as GABA and glutamate have been scarcely
studied. Recently, we found that the acute exposure to 100 mg ATR/kg does not causes alterations of GABA
or glutamate levels in several brain areas of the rat. To test if this lack of effect was due to the duration of
exposure, in this study we evaluated the effects of chronic exposure (one year) to 1 or 10 mg ATR/kg of
body weight on behavior and GABA, glutamine and glutamate levels of the nigrostriatal pathway. Behavioral
results showed that chronic ATR exposure causes hyperactivity in the group exposed to 10 mg ATR/kg, and increased anxiety in both groups exposed to ATR. GABA, glutamine and glutamate levels increased in ventral midbrain in the group exposed to 10 mg ATR/kg, whereas in the striatum the levels of glutamine were increased in the group exposed to 10 mg ATR/kg, and the levels of striatal glutamate were decreased in the group exposed to 1 mg ATR/kg. These data show that chronic ATR exposure causes alterations not only on dopamine levels but also on GABA, glutamine and glutamate levels of the nigrostriatal pathway, which in combination could underlie the behavioral changes observed.

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119. MICROGLIAL MODULATION OF OLFACTORY BULB ACTIVITY
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Optogenetics has been developed for the remote and highly specific control of the activity of several cell-types, mainly neurons. In recent years, gial cells have been considered potential targets for modulation by this technique. In this project, we used optogenetic stimulation of microglial cells to understand the role of this cell type in Olfactory Bulb (OB) physiology, specifically in its population activity and its response to odors. To achieve this purpose, we characterized the effects of microglial optogenetic stimulation on odor-evoked activity, in a transgenic mice (CX3CR1-CRE), which expressed channelrhodopsin-2 (ChR2) in microglia following viral transfection. Our results showed that microglial optogenetic stimulation causes a decrease in odor-evoked OB activity. Considering that TLR2-receptors are mainly expressed in microglia, we also evaluated the effect of microglia activation by a photo activatable TLR2 agonist. Our results showed a very similar effect to that induced by the microglial optogenetic activation. Finally, to assess the relationship of the microglial optogenetic activation with the animal’s olfactory ability, we performed an olfactory behavioral test before and after microglial optogenetic activation. Our last results showed that microglial optogenetic activation induces olfactory impairment. Altogether, these findings suggest that microglia regulates OB physiology and function.

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120. PACAP INFUSION ON THE CENTRAL AMYGDALA AFFECTS THE STRESS-RELATED BEHAVIORS: MALES AND FEMALES COMPARISON
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Stress is a set of responses that permit the body adaptation to the demands of the environment, with the goal of preserving the organism’s survival. Exposure to high levels of stress, modifies the system’s functionality and increases the probability of developing several pathologies such as depression, anxiety and post-traumatic stress disorder (PTSD). High levels of PACAP have been related to the development of depression and PTSD. Expression of this polypeptide under stress conditions contributes to the sustained activity of the hypothalamic pituitary axis (HPA) and an increase in stress-related behaviors. PACAP is widely expressed in regions involved in the regulation of stress response, such as the paraventricular
nucleus of the hypothalamus (PVN), basolateral amygdala (BLA) and central amygdala (CeA). The aim of this work was evaluate the behavioral effects of PACAP administration on the CeA to determine their role in stress responses in males and females. Adult rats (Wistar) were used to perform stereotaxic surgery for the implantation of infusion cannulae with coordinates: 2.4 to 2.6 mm caudal to bregma, ± 4.4 to 4.5 mm. lateral to the midline and 5.5 to 5.6 mm below the skull surface. Rats were divided into four groups: I control females, II PACAP females, III males control, IV PACAP males and infused the drug 10 minutes prior to behavioral testing (open field and elevated zero maze). PACAP micro infusion via intra-CeA cannula produced increases in freezing in the test before mentioned and these effects were also differential in males and females. And we concluded that PACAP in CeA can mimetic some stress-related behaviors and suggest the participation of PACAP in processes of fear and anxiety.

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121. EVALUATION OF MICROSTRUCTURAL WHITE MATTER FEATURES IN CROSSING FIBER REGIONS THROUGH DIFFUSION-WEIGHTED MAGNETIC RESONANCE IMAGING

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Diffusion-weighted Magnetic Resonance Imaging (dMRI) is a non invasive technique that allows to make inferences of tissue microstructure, widely used to characterise white matter. Advanced mathematical models are used to treat the large datasets derived from dMRI. The tensor model has been frequently used to this purpose. Unfortunately, this model does not provide reliable information about crossing fiber regions, which are present in more than two thirds of the white matter of adult humans. Several mathematical models have been proposed that seem to overcome the limitations of the tensor.

However, biological interpretations of such models are limited by the lack of histological validation. To this purpose, we have used an animal model of axonal degeneration through retinal ischemia. The objective of this procedure is to cause degeneration of the axons projecting from the retina that form the optic nerves that then cross the midline and meet their intact counterparts at the level of the chiasm. This model allows us to correlate metrics derived from the analysis of the DWI to histology. In a first step, we have used Constrained Spherical Deconvolution (CSD) to analyse the data obtained through dMRI. We have used this model because it shares some important advantages with the tensor model, i.e., reasonable acquisition times and easy interpretation, both crucial for eventual clinical applications.

The results obtained through the analysis of the DWI show that CSD is able to evaluate crossing fiber regions on the chiasm. We have completed the data acquisition and the analysis of the DWI is ready. Axonal density, evaluated through quantitative histology, is correctly reflected in metrics derived from CSD. Moreover, diffusion metrics accurately identify the affected axonal population within the chiasm. This work lends credibility to dMRI for use in clinical and basic research regarding neurodegeneration and neurodevelopment.

We thank Juan Ortiz for technical assistance for MRI scanning and Gema Martínez Cabrera for help with tissue preparation. GRV was supported by a scholarship (269114) from CONACYT, Mexico.
122. COGNITIVE DEFICITS IN PATIENTS WITH TEMPORAL LOBE EPILEPSY AND THEIR RELATION TO FORNIX MICROSTRUCTURE

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Temporal Lobe Epilepsy (TLE) is the most common focal epilepsy and is often treatment-resistant (Mathern et al. Epilepsy: A comprehensive textbook, Lippincott-Raven, 1997, p. 133-155). It has been shown that some patients with TLE exhibit progressive cognitive decline (Dodrill, 2004, Epilepsy and Behavior 5:S21-S24). However, the type and the severity of the cognitive deficits are not homogeneous between patients. Given that the hippocampus and nearby mesial temporal lobe structures are the affected in TLE, the aim of this study was to investigate if there is a relation between the microstructure of fornix, which represents the main afferent and efferent pathway of the hippocampus and cognitive performance in patients with TLE.

Methodology: This study included 15 patients with left TLE (6 Mesial Temporal Sclerosis [MTS], 9 without MTS) and 15 age and sex-matched controls. The Wechsler Memory Scale Fourth Edition (WMS-IV) and Wechsler Adult Intelligence Scale (WAIS-IV) was administered as part of the neuropsychological battery. We used Diffusion Tensor Imaging (DTI) to explore fornix microstructure measuring fractional anisotropy (FA) in right and left fornices. We performed Pearson correlation tests to relate FA left and right fornix to indices derived from the cognitive tests.

Results: Significant differences were found between groups in working memory index (p=0.004), delayed memory index (p=0.01) and auditory memory (p=0.02). There were no significant differences between mean FA value of the right fornix (patients 0.56 s.d.= 0.06, controls 0.59 s.d.=0.06; p=0.3). In the left fornix were found significant differences between mean FA value (patients 0.54 s.d.=0.06, controls 0.59 s.d.= 0.07; p=0.04). We did not find correlations between WAIS-IV and WMS-IV with fornix FA values in patients with TLE, but in the control group were found positive correlations between FA value of the right fornix and processing speed (p=0.02, r=0.57).

Conclusions: In this sample of patients we found differences between groups in working, delayed and auditory memory, but did not find any relations between fornix integrity and cognitive performance in patients with TLE. Other white matter tracts are being queried for this correlation.

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123. THE ROLE OF SOMATOSENSORY THALAMO-CORTICO-STRIATAL CIRCUITS DURING THE LEARNING AND EXECUTION OF MOTOR SEQUENCES.

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The basal ganglia (BG) are classically associated with the execution of voluntary and automatic movements. The main input nucleus of the BG, the striatum, integrates information from different cortices. Anatomical and electrophysiological evidence suggests that, to produce automatic motor sequences, the dorsolateral region of the striatum (DLS), also known as the sensorimotor striatum, coordinates sensory and motor
information from cortical and thalamic regions. Nevertheless, after decades of intense investigation and due to the lack of ad hoc behavioral models, there is still no direct evidence linking the sensory-motor integrative properties of the DLS with complex behaviors. To disentangle the specific role of somatosensory information in thalamo-cortico-striatal circuits during the learning and execution of automatic motor sequences, we combined structural lesions and pharmacological/optogenetic manipulations, with a behavioral protocol in which rats develop a stereotypical motor sequence under tight spatio-temporal constrains. Lesion experiments of thalamo-striatal and cortico-striatal pathways indicate that the flow of somatosensory information to the DLS is instrumental for the precise learning of the motor sequence without affecting basic movement's variables, such as speed. Furthermore, once the sequence was learned and over-trained, lesions and pharmacological/optogenetic manipulations significantly disrupted performance. Notoriously, in both conditions before and after learning, experimental manipulations specifically altered the “temporal” domain of execution. Complementary electrophysiological recordings in anesthetized animals revealed that, bilateral somatosensory stimulation of the forelimbs mimicking locomotion, reliably produced rhythmic sensory representations in cortico-striatal loops. These representations were absent in lesioned animals and disrupted by optogenetic manipulations of sensory relays. Our results provide direct evidence of the role of sensory information in thalamo-cortico-striatal circuits, suggesting that during sensory-motor integration, a rhythmic somatosensory flow to the BG provides a temporal framework for the learning and execution of automatic actions.

124. ANALYSIS OF DELETIONS IN THE HUMAN MITOCHONDRIAL GENOME

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Mitochondria are subcellular organelles specialized in the production of energy by oxidative phosphorylation. They contain a genome of circular DNA bearing genes which are fundamental for the oxidative phosphorylation. Deletions in the mitochondrial genome cause diverse neurological and debilitating diseases which diagnosis is difficult due to the heterogeneous nature of the pathologies and to limitations in current molecular detection methods. The purpose of this work was to analyze the deletions in mitochondrial DNA from healthy subjects by the extraction of circular DNA from somatic human cells, is massive sequencing and a bioinformatics analytical method based on Blat and Linux.

We found that the 41.3% of the genomes have deletions assuming the independence of events and just one deletion per genome. We identified deletions of various different sizes distributed throughout the genome, the majority of which involve the loss of a single nucleotide. Only 1.94% of the deletions involve in their extremes at least a 4-nucleotide direct repeat and the largest identified was 8 nucleotides long. There are 25 deletions (0.7%) in common on the three samples analyzed. The most abundant deletion corresponds to the sequence between the positions 521-524 which is present in two of the three samples at 1.13% and 2.58% of heteroplasmy.

The main finding of this work is that the mitochondrial genomes of healthy individuals contain a high diversity of deletions each present at low frequencies. Alterations in the relative abundance of these deletions are predicted to be associated to mitochondrial disease.

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125. TIME RESTRICTED FEEDING WITHOUT REDUCING CALORIC INTAKE PREVENTS METABOLIC DISEASES IN A OBESOGENIC MODEL

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In order to adapt to the daily cycles of nutrient availability, energy metabolism in animals has evolved to be cyclical. These metabolic cycles arise from cell autonomous circadian rhythms and the feeding-fasting cycle which drive genomic programs. Perturbation of circadian oscillator components leads to obesity and diabetes, illustrating the importance of this interconnection. To test whether robust metabolic cycles can protect against nutritional challenges that predispose to obesity, we adapted a widely-used rodent model of diet-induced obesity. To test whether a distinct tRF regimen can prevent diet-induced obesity, we subjected 6 weeks-old male Wistar rats to high fat diet (HF; 20% fat, 20% fructose, 0.15 % sodium colate) or normal chow (NC; 15% fat) under either ad lib or time restricted access to food during ligh phase (7h; CT4-CT11). Rats fed high fat diet under ad libitum regimen displayed in serum an increase in cholesterol (100%), triglicerides (100%), TNFα (40%), INF gamma (20%); in liver showed an increase of fat and damage in tissue (3.3). After time restricted Access, rats displayed a decrease in cholesterol (68%), triglicerides (61%), LDL (73%), VLDL (61%), INF gamma (19%), IL6 (12%), TNFα (38%) and interestingly augmented MCP-1 (400%), and also in liver showed a decrease in fat levels (10%) and damage tissue (1.7). Limiting access to high fat diet during day for up to 8 weeks shows some improvement in body weight regulation. Time restricted feeding (tRF) improved metabolic function, and protected the rats from the adverse effects of a high fat diet.

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126. REDUCED PROLACTIN RECEPTOR EXPRESSION INDUCED BY SHRNA-LENTIVIRAL VECTORS DIMINISHES PREADIPOCYTE DIFFERENTIATION AND LOWERS THE EXPRESSION OF ADIPOCYTE FUNCTION MARKERS

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Obesity is characterized by excessive accumulation of body fat, and it leads to adipose tissue dysfunction and insulin resistance. Low levels of prolactin (PRL) correlate with prevalence of obesity, type 2 diabetes and metabolic syndrome in humans and rodents; and recently, we demonstrated that PRL improves insulin sensitivity by preserving adipose tissue fitness. Specifically, in rodents PRL prevents adipocyte hypertrophy and increases their hyperplasia, increases Pparg and reduces Il1b expression in visceral adipose tissue and elevates serum adiponectin levels; and in humans, serum PRL levels correlate positively with the expression of markers of adipose tissue functionality. Now, the question is whether PRL has a direct role regulating preadipocyte differentiation and adipocyte functionality. In this work, we evaluated whether knockdown of PRL receptor (PRLR) alters preadipocyte differentiation and whether lack of PRLR in mature adipocytes alters the expression of adipocyte functionality markers. In order to silence PRLR expression we used lentiviral vectors containing short hairpin RNA in preadipocytes and adipocytes from visceral and subcutaneous adipose tissues of mice. We found that compared to GFP-shRNA or scrambled-shRNA, treatment with PRLR-shRNA reduced PRLR expression in preadipocytes and adipocytes by >70%. Also, treatment with PRLR-shRNA but not with control-shRNA in preadipocytes, inhibited both visceral and subcutaneous preadipocyte differentiation into mature adipocytes, as observed by lack of lipid accumulation.
and reduced expression of differentiation markers: CebpA and Pparg. Also, treatment with PRLR-shRNA but not control-shRNA in mature adipocytes reduced the expression of functionality markers Fas, Glut4 and adiponectin in cells from both adipose depots. In conclusion, acting through its cognate receptor, PRL plays a direct role in adipocytes, regulating visceral and subcutaneous preadipocyte differentiation and mature adipocyte functionality. Our results support the hypothesis that reduced PRL levels during obesity contribute to adipose tissue dysfunction.

We appreciate the technical assistance of MVZ. Martín García, Dra. Alejandra Castilla, Nutr. Fernando López, MC. Gabriel Nava, Daniel Mondragón and Antonio Prado.

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127. FUNCTIONAL IDENTIFICATION OF GLIAL CELLS IN THE STRIATUM

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The striatum is part of the basal ganglia functional circuitry. This region is involved in motor command execution. The neuronal organization of the striatum has been extensively studied, but little is known about neuroglia function, despite the fact that glial cells outnumber neural density. Functional identification of neuroglia is necessary to understand the striatum physiology and its dysfunction in neuropathologies such as Alzheimer and Parkinson diseases. Recent studies have shown that sulforhodamine 101 (SR101) can be used as a reliable marker of glial cells. Thus, the aim of this study was to perform functional identification of glial cells in the striatum.

Methodology: Coronal brain slices including the striatum (300 µm), were obtained from GFAP-EGFP mice or Wistar rats at P8-P10. Slices were maintained in ice-cold artificial cerebrospinal fluid (ACSF) for recovery after sectioning (45'). In a first set of experiments, slices from GFAP-EGFP mice were incubated in ACSF + 1 µM SR101 at 37ºC, for 10', and the percentage of GFAP+ cells that upload SR101 was determined. In a second set of experiments, slices pre-stained with SR101 incubated with ACSF + 10 µM Fluo-4 AM for another 30', and the calcium response to 100 µM ATP was recorded in SR101+ cells with a CCD camera attached to an upright microscope. Images were acquired (1Hz) and analyzed with Image J software. Calcium variations recorded from neuroglia somata were estimated as changes of fluorescence signal over baseline (F/F0).

Results: The majority of GFAP-EGFP positive cells uploaded SR101 (92%; 1197/1274 cells, from 8 slices, from 3 mice). Likewise, the majority of SR101 positive cells uploaded Fluo-4 AM (94%, 1212/1292 cells, from 8 slices, from 3 animals) and 88% of these cells elicited a calcium response evoked by extracellular application of ATP.

Conclusions: Functional identification of glial cells from striatum can be performed with the combined use of SR101 and Fluo-4 AM.

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128. SUBCLINICAL DOSES OF AN ATP-SENSITIVE POTASSIUM CHANNEL BLOCKER PREVENT ALTERATIONS IN MEMORY AND SYNAPTIC PLASTICITY INDUCED BY AMYLOID-β

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The ATP-sensitive potassium channels (K<sub>ATP</sub>) modulate neural circuits coupling metabolism and cellular excitability. In the hippocampal circuit, K<sub>ATP</sub> are involved in synaptic plasticity, expression of typical rodent behaviors and in learning and memory processes. Remarkably, the Amyloid-β peptide (Aβ), a histopathology marker of the Alzheimer’s disease (AD), modulates K<sub>ATP</sub> activity and expression. Conversely, modulation of K<sub>ATP</sub> activity modifies Aβ levels and cellular effects. This evidence suggests a functional relationship between K<sub>ATP</sub> and Aβ that could be relevant for Aβ -induced pathology and AD progress. Thus, in the present work, we tested whether a K<sub>ATP</sub> blocker (Tolbutamide) modifies Aβ -induced deleterious effects on a typical rodent behavior (burrowing), contextual memory, hippocampal network function, and synaptic plasticity. Our results show that acute treatment with Tolbutamide avoid Aβ -induced inhibition of hippocampal network activity, but no the Aβ -induced inhibition of long-term potentiation, in vitro. Furthermore, chronic treatment with subclinical doses of Tolbutamide (those that did not change glycemia, weight gain and motor activity) prevent the increase of burrowing and the deficit in contextual memory induced by the hippocampal infusion of Aβ. Furthermore, Tolbutamide treatment prevented Aβ -induced hippocampal network activity inhibition and long-term synaptic plasticity unbalance (inhibition of long-term potentiation and induction of long-term depression). Interestingly, we found that the protective effect of Tolbutamide against Aβ -induced memory deficit correlated with the reestablishment of synaptic plasticity balance. Altogether, these findings indicate that K<sub>ATP</sub> are involved in Aβ -induced pathology and show that K<sub>ATP</sub> are plausible therapeutic targets against AD.

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129. OPERANT CONDITIONING PARADIGM IN HEAD-FIXED RATS FOR YUXTASOMAL RECORDINGS IN THE CEREBRAL CORTEX

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The Head-Fixed technique, in combination with operant conditioning paradigms, involving skilled movements (reach, leap, etc.) and simultaneously in vivo cell recordings, has been successfully used for the analysis of neuronal function and behavior. Considering the multiple uses of this technique, and the natural ability of rodents to execute movements with their forelimbs, here we develop a behavioral task involving planning and execution of a qualified movement under Head-Fixed conditions (lever pressing) with the left forelimb. Wistar rats with acute water deprived were operantly conditioned in daily sessions of 1 hour to perform pressing movements in response to a visual cue. In order to simplify the learning, the task was presented in successive approximations: in the 1st stage, the rats learned to touch a standard lever to acquire the reward (water); in the second stage, the rats learned to associate the cue (light) with the reward reached 80% of efficiency after 20 consecutive sessions. Lower learning efficiency were observed using saccharine as a
reward. In the 3rd stage, head-fixed were associated with the reward. Finally, in the 4th stage the rats learned to associate the cue with the reward in head-fixed condition. Our results show that the performance of an operant conditioning task, under Head-Fixed conditions are similar to the free-moving animal tasks and that the presentation in successive stages of conditioning simplifies the adaptation of the animals to the task.

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130. EFFECTS IN PSYCHOMOTOR DEVELOPMENT IN INFANTS INCLUDED IN A PSYCHOMOTRICITY PLANNED PROGRAM

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Introduction. Human development consists in a sequence of changes in the physical characteristics and motor skills. The development is not possible without brain maturation, as well as different body systems such as muscles, bones, etc. It is considered that infants with brain injury or risk of suffering the brain damage are more susceptible to have developmental disorders. Early treatments as neurohabilitation, infant massage and some others can minimize brain injury sequelae and help the development in this population. Objective: The objective is determining the effects of the psychomotricity planed program (PPP) in gross and fine motor, cognitive and language performance at 10 and 14 months.

Method: 70 infants whom received neurohabilitation treatment during the first six months of age were included and divided in two groups. The group in PPP attendance at the psychomotricity room twice a week and practice activities such as motor coordination, solving problems, vocal games, among others according to their age. The other group has not attendance to any PPP.

Results: Infants included in PPP group showed better performance scores in fine motor (p=.0001) at the age of 10 months and 14 months, as well as in cognitive domain at 10 (p=.001) and 14 (p=.0001) months, and language at 10 (p=.0001) and 14 (p=.009) months.

Conclusion: The initial neurohabilitatory treatment is important to minimize sequelae, but it is required to continue the treatment by the follow up of these infants to improve the other domains included in neurodevelopment.

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131. IDENTIFICATION OF HUB GENES ASSOCIATED WITH ADIPOGENESIS IN VISCERAL AND SUBCUTANEOUS ADIPOSE TISSUE

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Adipose tissue expansion is the result of hyperplasia or increase in adipocyte precursor cell number and their differentiation into mature adipocytes (adipogenesis), and of hypertrophy or enlargement of existing mature adipocytes by triglyceride accumulation. Most of the studies on the molecular events of adipogenesis have been carried out using in vitro models, whereas the molecular networks governing in vivo adipogenesis are still poorly understood. In this work, we asked whether the transcriptional cascade of adipogenesis differs between visceral and subcutaneous adipose tissues (VAT and SAT).

Using in silico analysis, we combined previously available information from two independent gene microarrays containing gene expression analysis from 1) preadipocytes and 2) adipocytes, from VAT and SAT, to identify genes and gene networks that differ between fat depots in this in vivo adipogenesis model. Data analysis consisted of three steps: statistical analysis, machine learning and data mining. The expression matrix determined a total of 5964 genes that were included in the analysis in both VAT and SAT. 32.4% vs 28.5% of the genes were upregulated and 50.2% vs. 45.3% downregulated in mature adipocytes compared to preadipocytes in VAT vs. SAT, respectively.

We found subtle differences in gene expression between fat depots regarding adipogenic related genes, that may be responsible for different adipogenic processes between depots. Also, hub genes analysis in co-expression networks for both downregulated and upregulated genes in both deposits, and analysis of functional protein association networks showed that VAT hub genes: Hic1, Rora, Zic3 and Nr1i3; and SAT hub genes: Tcf3, Smad3, Nr6a1, Irf8, Gata4, Mef2d, Nr5a1, Rorc y Tef; may be important adipogenic regulators. In conclusion, there are intrinsic differences in transcriptional programming of adipogenesis between deposits; being equally important the differences in gene expression patterns, as well as in the specific interactions that the same genes establish in different deposits.

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132. ANXIETY SYMPTOMS IN PREGNANT WOMEN WITH FETAL ANOMALIES

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Introduction: Early detection of fetal anomalies increases the survival of those fetuses that otherwise would not be born. Theoretical and probabilities of survival approaches have considered that pregnancy is an emotionally vulnerable period for the women. However, diagnosis and treatment of a fetal anomaly could be a risk factor to develop anxiety and depression symptoms. At the Children and Women Specialty Hospital of Queretaro, pregnant women are evaluated by a fetal medicine specialist, where a decision is made whether the anomaly is candidate for fetus surgery or treatment.

Objective: To understand more about the mental health of those women, the objective of this study is to compare anxiety symptoms of pregnant women with fetal anomalies with those with normal fetus.

Method: A total of 197 pregnant women participated in this study (M= 26.5 years, SD= 5.6). The sample was divided into two groups; a control group were pregnant women that have a fetus in healthy conditions (N =
69) and a case group where a fetal anomaly was detected (N = 128). All participants were asked to answer the Anxiety Beck Inventory upon diagnosis and counselling.

**Results:** The results showed a significant difference on anxiety symptoms between pregnant women with fetal anomalies and the control group (t = -2.5, p < .05). Severity of symptoms was higher in the case sample (8.6%) than the control group (1.4%).

**Conclusion:** As suspected, this study shows that pregnant women with a fetal anomaly have a higher rate of anxiety symptoms. This leads to consider that a psychological intervention during this stage of management is relevant. It is also important to evaluate mother-fetus relationships in pregnant women with fetal anomalies.

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**133. GENOMIC DELETIONS IN SOMATIC CELLS IN MICE**

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The somatic cell genome of various metazoan species may undergo different types of rearrangements. Small or large regions of the genome may be lost, moved, interchanged or inserted during embryonic development or during differentiation of specific cell types. Genomic rearrangements have also been associated to carcinogenesis and aging. In this work, this phenomenon is studied in a model organism from which its genome is sequenced, allowing the analysis of DNA sequencing data. Here we aim to determine, classify and evaluate the diversity and frequency of deletions of non-repetitive regions as well as sequences of long interspersed nuclear elements (LINEs) that are close to coding regions in cells of different healthy mouse tissues. For the analysis, sequencing data was obtained from the Sequence Read Archive (SRA) of the National Center for Biotechnology Information (NCBI) database. The data were mapped against the Reference Genome Reference GRCm38 / mm10 using Segemehl version 1.2 and we are currently identifying deletions that may have taken place in germ line or in somatic cells.

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**134. PROLACTIN RECEPTOR KNOCKOUT MICE ARE MORE SUSCEPTIBLE TO DEVELOP FATTY LIVER DURING LACTATION**

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Maternal obesity or overnutrition during pregnancy and lactation lead to metabolic alterations in their offspring, including the development of fatty liver. The hormone prolactin (PRL), a key regulator of the lactation process, also exerts metabolic and growth promoting effects in the liver. PRL stimulates liver growth, hepatocyte proliferation and also liver insulin sensitivity. Unpublished results from our group show that a high fat diet (HFD) feeding during lactation results in reduced PRL levels in the milk of rats, and that this
diminution contributes to the metabolic alterations observed in the offspring; mainly insulin resistance, fatty liver and increased visceral adiposity. Therefore, in this study we evaluated whether the absence of prolactin actions favors the development of non-alcoholic fatty liver disease in lactating offspring in conditions of normal feeding or overnutrition. To this end, we used C57BL/6 PRL receptor null (Prlr-/−) or their wild type pairs (Prlr+/+) lactating mice, nursed by mothers fed with a control diet (CD) during pregnancy, and a CD or a HFD during the 21 days of lactation. At the end of lactation (postnatal day 21), Prlr-/- offspring from HFD-fed mothers, showed increased liver to body weight ratio compared to Prlr+/+ mice. Also, Prlr-/- mice showed higher liver TAG (triglyceride) accumulation than their Prlr+/+ counterparts, but only when nursed by control diet dams. Moreover, we observed altered response in the expression of genes involved in hepatic metabolism; FAS (fatty acid synthase) ChREBP (carbohydrate responsive element binding protein), and glucose 6-phosphatase (G6pase) in Prlr-/- mice nursed by CD and HFD-fed mothers compared with their Prlr+/+ pairs. In conclusion, our results demonstrate that lack of prolactin signaling in lactating offspring favors metabolic alterations in the liver, and thus supports that PRL has an important role in hepatic metabolism in the nursing offspring.

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135. ALTERED RESTING STATE FUNCTIONAL CONNECTIVITY OF LEFT FRONTOPARIETAL NETWORK IN HEAVY CANNABIS USERS

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Cannabis is known to impair, both after acute and chronic use, executive functions including working memory and attention, which are related to frontoparietal networks. In this work we explored the potential differences in resting state functional connectivity (RSFC) in frontoparietal networks (FPN) between a group of heavy cannabis users and nonconsuming controls. The sample included 50 heavy cannabis users (at least 16 joint per month in the year previous to imaging; mean age: 28 ± 7.09 years; 39 males) and 48 nonconsuming controls (mean age: 26.4 ± 7.14 years; 32 males). Cannabis consumption was quantified as the monthly number of joints reported by consumers. A 3T MRI scanner was used for resting state functional MRI acquisition (300 volumes per subject, TR=2s, 3x3x3 mm3 voxels). After standard preprocessing (no global signal regression), an independent component analysis (limited to 20 components) was performed with FSL’s MELODIC in order to identify the Default Mode, Dorsal Attention and unilateral FPN. Dual regression was conducted to find individual networks and two-group t-tests were performed to contrast functional connectivity between groups. There was no significant age difference between groups (t(96)= 1.1993, p=0.2334). No psychotic symptoms were found in any of the participants. Among the obtained components, 5 were considered as artifacts. The four networks of interest were visually identified as single components. Among these, the consumers showed decreased functional connectivity in the left FPN, specifically in the left supramarginal gyrus. The findings here presented suggest altered functional connectivity of the FPN related to heavy cannabis use. These results may also suggest a potential correlate of altered functional connectivity and impaired executive functions, typically observed in heavy cannabis users. These results warrant further exploration of the possible relation of heavy cannabis use, RSFC and cognitive performance.

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136. THE PROLACTIN FRAGMENT COMPRISING AMINO ACIDS 1 TO 79 IS A VASOINHIBIN

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Vasoinhibins are a family of antiangiogenic peptides ranging from 14 to 18 kDa that are generated by the proteolytic cleavage of prolactin (PRL). Smaller PRL fragments have been detected endogenously and cathepsin D, one of the proteases generating 15 to 17 kDa vasoinhibins, also cleaves PRL into a ~9 kDa fragment. However, the vasoinhibin nature of PRL fragments smaller than 14 kDa is unknown. The aim of this study was to determine if an 8.91 kDa PRL fragment comprising amino acids 1 to 79 (Vi79) has vasoinhibin properties. Recombinant Vi79 was produced by transient transfection of HEK293T cells and by lentiviral transduction of bovine pulmonary artery endothelial cells (CPAE). The conditioned medium of transfected HEK293T cells contained the expected PRL fragment (Vi79) and inhibited the proliferation and migration of CPAE cells with an activity comparable to that of the conditioned medium of HEK293T cells expressing a recombinant 14 kDa vasoinhibin (control).

Moreover, CPAE cells transduced with lentiviral vectors encoding Vi79 (LV-Vi79) secreted the Vi79 and reduce its proliferation after transduction. These results show that Vi79 is a member of the vasoinhibin family and, thereby, that vasoinhibin biological determinants are contained within the first 79 amino acids of the PRL molecule. Experiments are underway to investigate the relative potency of Vi79 in relation to the bigger members (14-18 kDa) of the vasoinhibin family.

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137. ELECTROPHYSIOLOGICAL CHARACTERIZATION OF RAT HEPATOCYTES SUBJETED TO CONDITIONS OF FASTING AND FEEDBACK

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Liver is one of the main organs involved in the metabolic processing of nutrients. Hepatocytes fulfill important roles in metabolic, secretory and endocrine functions, and they have oscillatory electrical activity even though they are no excitable cells. The aim of the present study was to characterize the spontaneous oscillatory ion currents in hepatocytes of Wistar male rats (180-200 g) with a normal diet, subject to conditions of fasting (24 and 48 h) and with 2 h of feedback conditions after these fasting periods; as well as to determine which ions generate this electrical activity. For this purpose, we recorded ion current in hepatocytes by using the whole-cell voltage-clamp technique; and changed the ion composition of extra- and intracellular solutions, adding ion channel blockers (tetraethylammonium, Cs+, Ba2+ and N-Methyl-D-glucamine), and varying the holding potential. Our results show that hepatocytes of control rats had the most prominent spontaneous oscillatory electrical currents with a high frequency (2.5–0.2 Hz) and amplitude (300–600 pA) with different patterns through the time. By replacing the extracellular Na+ both frequency and amplitude of the hepatocyte electrical
activity significantly decreased. In contrast, K+ channel blockers did not modify significantly the activity. Finally, by maintaining the membrane potential at -30 mV (the equilibrium potential of Cl-), the membrane current was almost null. Electrical activity changed with the experimental conditions of fasting and feedback. In fasting conditions, 75% hepatocytes had a very low electrical activity at the beginning, with amplitude of ~200 pA. Interestingly, the amplitude of oscillatory electrical currents recovered after feedback (~500 pA). All these results strongly suggest that Na+ and Cl- are the most permeable ions through the membrane of hepatocytes, with less contribution of K+, and those changes in rat metabolism impact spontaneous oscillatory electrical currents through the membrane of hepatocytes.

These changes in electrical activity may be relevant to study liver diseases such as steatosis, steatohepatitis, fibrosis, cirrhosis or even hepatocarcinome.

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138, PHYSOSOTIGMINE ENHANCES HIPPOCAMPAL GABAergic TRANSMISSION BY α7 NICOTINIC RECEPTORS

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The GABAergic transmission is mediated by the γ-aminobutyric acid (GABA, considered as the main inhibitor neurotransmitter) by binding to activate ionotropic GABAA receptors. On the other hand, presynaptic nicotinic acetylcholine receptors (nAChRs) modulate the release of neurotransmitters such as GABA and glutamate. In this sense, nicotinic ligands (agonists, antagonists and modulators), including the ACh and choline alter GABA release. Interestingly, physostigmine (an inhibitor of acetylcholinesterase), besides alters the levels of ACh acts as agonist, antagonist and modulator of nAChRs. Thus, the aim of this work was to determine whether physostigmine modulates the GABAergic transmission and whether this modulation is mediated by nAChRs. The experiments were performed on brain slices of 350 µm obtained from Sprague-Dawley rats of 18-32 postnatal days, using the whole-cell voltage-clamp technique. We recorded GABAergic spontaneous inhibitory postsynaptic currents (sIPSCs) in interneurons of the stratum radiatum hippocampal CA1 area at a holding potential of -70mV. When physostigmine (20 µM) was applied in the bath perfusion, the frequency and amplitude of sIPSCs increased, which were reverted by adding the non-selective nAChR antagonist mecamylamine (10 µM), indicating that physostigmine actions are mediated by nAChRs. Likewise, when the selective α7 nAChR antagonist mefilicaconitine (10 nM) was applied in the presence of physostigmine, the frequency and amplitude of sIPSCs partially recovered to control values. We conclude with these results that physostigmine promotes a positive effect on GABAergic transmission received by hippocampal stratum radiatum interneurons, and that physostigmine may act as agonist and/or positive modulator of α7 nAChRs, likely present in the presynaptic neurons.

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139. ANALYSIS OF METABOTROPIC GLUTAMATE RECEPTOR TYPE 5 IN LIVER UNDER PHYSIOLOGICAL AND PATHOLOGICAL CONDITIONS

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Background. Glutamate is an excitatory neurotransmitter in the central nervous system and has been associated to neurological diseases. Recently, several evidences have demonstrated that glutamate signaling also participates in the physiology and pathophysiology in peripheral tissues. The metabotropic glutamate receptor 5 (mGluR5) has been found in liver and apparently has a role in survivor and cellular death, however, it’s not clear its role in the pathophysiology of the liver diseases. Since liver is the main source of circulating glutamate, it is relevant to know if the level of mGluR5 is modified under metabolic challenges or pathological conditions. The objective of this work is to analyze the expression of the mGluR5 in the liver under physiological and pathological conditions.

Methodology. Adult male Wistar rats were maintained in a 12:12 h light-dark cycle. Rats under physiological conditions were maintained under restricted feeding schedule with food access for 2 h every day, during 3 weeks and control rats with ad libitum feeding. Liver samples were obtained at 3 h intervals, during a 24-h period. Rats with pathological conditions were injected intraperitoneally with diethylnitrosamine once a week during 8, 12 and 16 weeks to induce fibrosis, cirrhosis and hepatocarcinoma, respectively. The mGluR5 was evaluated by Western-blot and Immunohistochemistry.

Results. We observed the presence of the mGluR5 subtype b in a circadian rhythm pattern, that was not changed in response to restriction protocol. The mGluR5 subtype b was seem to be located in liver sinusoidal endothelial cells.

Under pathological conditions, mGluR5 did not change under fibrosis and cirrhosis stages and exhibited a significant high expression in tumors of hepatocarcinoma.

Conclusions. It is the first time that mGluR5 subtype b is detected in liver under physiological and pathological conditions. Results of this study suggest that glutamate might have an important role in liver physiology and pathology through mGluR5.

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140. PROLACTIN PROTECTS RAT CORTICAL ASTROCYTES AGAINST OXIDATIVE STRESS

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Astrocytes maintain brain homeostasis by maintaining synaptic integrity, providing protection and metabolic support for neurons, regulating inflammatory response, and promoting cell survival under oxidant conditions. Several types of stress, injuries and brain diseases induce mitochondrial dysfunction and oxidative stress that leads to astrocyte death. Prolactin (PRL) is a stress-related hormone that limits gliosis and degeneration of the neural retina (Arnold et al JN 2014). In this work, we investigated whether PRL protects cortical astrocytes against oxidative stress and cell death. Primary cultures of cortical astrocytes were isolated from the brain of neonatal Wistar rats and their purity determined by GFAP positivity by immunocytochemistry. The long isoform of the PRL receptor was detected in cortical astrocytes by qRT-PCR. Astrocytes were
treated with increasing concentrations of PRL (0.1-100 nM) for 24 hours and then were exposed to oxidative stress induced with 400 μM hydrogen peroxide (H₂O₂) for 3 hours. Incubation of cortical astrocytes with PRL inhibited H₂O₂-induced cytotoxicity, evaluated by the MTT assay, in a dose-dependent manner. Moreover, PRL treatment (10 nM) induced an increase in the expression of its receptor, GFAP and antioxidant enzymes such as superoxide dismutase, peroxiredoxin 6 and glutathione peroxidase 1 under basal condition in astrocytes, and this change in the expression was exacerbated by H₂O₂-induced oxidative stress, evaluated by qRT-PCR. These results indicate that PRL can act directly on astrocytes to protect them against oxidative stress injury.

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141. COMPARISON BETWEEN THE NEUROENDOCRINE MECHANISMS REGULATING THE SYNTHESIS AND RELEASE OF REPTILIAN, AVIAN AND MAMMALIAN PITUITARY GROWTH HORMONE (GH)

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The regulation of GH synthesis and release in the somatotropes is controlled by several neuropeptides such as GHRH, TRH, PACAP, ghrelin, GnRH and somatostatin. There are only a few studies that analyze the role of these neuropeptides upon the pituitary GH regulation during evolution. We compared the effect of the neuropeptides (at 10nM) and its potency in the regulation of GH (in vitro) in reptiles (green iguana), birds (chicken) and mammals (rat). In rat pituitary cultures, we found that GHRH stimulated GH release at 1 and 4 h, while GH mRNA expression was increased at 2 and 6 h post treatment. TRH had no effect on GH release, while it stimulated GH mRNA expression after 2 and 6 h. In chicken pituitary cultures, GHRH increased GH release at 6 h, while GH mRNA increased its expression within 2 h, decreased at 4 h, and increased again after 6 h of incubation. TRH stimulated GH secretion at 4 h, while GH mRNA expression increased after 4 and 6 h post-incubation. In iguana pituitary cultures, we found that after 4 h of incubation GHRH stimulated GH release similarly to GH mRNA expression. TRH showed no significant effect on the secretion of GH while the expression of GH mRNA was increased. Regarding PACAP, a tendency to increase both, GH secretion and mRNA expression was observed, however, there was not significant effect. GnRH had not effect upon the regulation of iguana GH. Ghrelin had no significant effect on GH secretion, whereas it decreased GH mRNA expression. Finally, somatostatin inhibited both, GH release and mRNA expression. Our results indicate that GHRH is conserved during evolution as the principal regulator of both, the synthesis and release of GH in all the studied species, whereas TRH have a more potent effect in birds than in mammals and reptiles. In iguana, it appears that GHRH and TRH, as well as PACAP, have an important role in regulating GH. We confirmed that somatostatin is a negative regulator of GH synthesis and secretion. These data indicate that the control of GH expression and release shows variations along the phylogenetic scale.

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142. EVALUATION OF THE EFFECTS INDUCED BY DIFFERENT TIMES OF EXPOSURE TO STRESS

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Stress is a response related with the perception of an aversive stimulus that triggers a systemic modulation that increases the probability survival. Exposure to stressful situations do happen along the entire life of an organism and these events can drive to a different range of psychopathologies. One of the current goals of stress research is to build animal models that allow us to study the effects of stress in rodents to mimic different characteristics of psychopathologies like depression. In fact, there is a chronic stress battery that allows us to reproduce some feature of major depression. However, there are several methodological aspects that should be addressed to validate animal models. Particularly for chronic stress, the durations of stress protocols can differ among laboratories. The objective of this current study is to evaluate the behavioral effects of different durations (in days) of stress protocols in rats. The time windows of exposure were 5, 10, 14 and 21 days to a chronic unpredictable stress battery (CUSB). A time-effect curve was established with four windows with measures of anxiety-like and depression-like behaviors. The rats exposed for 5 and 21 days developed more anxiety-like behaviors than the other groups. An anhedonic effect, a depression-like behavior, was observed in the animals exposed for 10, 14, and 21 days. Our results suggest that the shortest windows of exposure cause anxiety-like states that are not accompanied by depression-like behavior. However, the longer exposure windows seem to induce depression-like behavior but only 21 days of exposure establish anxiety-like behaviors. It means that only the longer exposure window works for the results wanted in this protocol and the other exposure windows don’t, but we can have a totally different effect if we modify the duration of the protocol and this range of effects could be used as the start point of other models that mimic different psychopathologies.

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143. BIPARENTAL CARE CONTRIBUTION TO THE ADULT NEUROGENESIS IN THE PRAIRIE VOLE

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In most of the modern societies is increasing the engagement of the father in the raise of the children resulting in behavioral, emotional and cognitive benefits for the progeny. However, the neurobiological effects of the biparental care are not well understood. Microtus ochrogaster, the prairie vole, is a good animal model for studying the biparental care of the offspring (BP) because they build a strong pair bond with their mate and both share the care of their pups. When prairie voles are raised only by their mother (monoparental, MP) they will need more time to build a pair bond and will take less care of their own pups in the adulthood. In mice, male pups raised by their mother alone show a decrease in the hippocampal adult neurogenesis and spatial learning deficits. Here we evaluated if MP raised male and female voles show alterations in their development, olfactory related behaviors and, in former experiments, we will determine whether this behavior can be related to an alteration in adult neurogenesis. Our results show that BP raised voles are more frequently licked (p<0.05, F1,15= 4.778) and they also display their ears earlier (Postpartum Day 0; PPD0, p<0.05; PPD3, p<0.05) but they don’t differ with MP on the day they open their eyes or in their weight at weaning. In current experiments, we evaluate if paternal care will change adult neurogenesis in the olfactory bulb of both males and females. We expect to correlate these changes with differences in olfactory-related behaviors.
144. PROLACTIN PROMOTES THE HYPEROXIA-INDUCED INHIBITION OF RETINAL NEOVASCULARIZATION IN NEWBORN MICE

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Retinopathy of prematurity (ROP) is a potentially blinding retinal neovascular disease. Prolactin (PRL) circulating levels are higher in ROP than in control patients and such imbalance may influence ROP progression. PRL accesses the retina from the systemic circulation and is pro-angiogenic but can be cleaved to generate anti-angiogenic PRL fragments (vasoinhibins). Like preterm infants, newborn mice have incomplete retinal vascularization at birth and exposure to high oxygen, mimicking supplemental oxygen given to premature infants for respiratory care, induces a loss of new blood vessels in the retina that can lead to retinal neovascularization. Here, we have investigated the vascular effects of PRL in the retina of newborn mice exposed to high oxygen. Retinal neovascularization was assessed in mice throughout the first 8 days after birth in flat-mounted retinas immunostained for blood vessels. At postnatal day 1 (P1) the retina is almost devoid of blood vessels, which originate from the optic nerve and migrate radially reaching the periphery at P8. Exposure of P6 mice and nursing mothers to hyperoxia (75% oxygen) inhibited retinal vessel growth as determined by a 40% reduction in vascular density and a significant decrease (p<0.05) in the expression of endothelial cell markers (CD31, VEGF, and VEGF receptor 1). Treatment with PRL (2 μg/g i.p. twice a day from P5 to P8) increased hyperoxia-induced inhibition of retinal vessel growth. The anti-angiogenic effect of PRL may be favored by its higher conversion to vasoinhibins under hyperoxic conditions. Hyperoxia increased the rate of PRL conversion to vasoinhibins by retinal proteases as shown by the incubation of PRL with retinal extracts from newborn rats exposed to hyperoxia. These results suggest that high levels of systemic PRL in ROP favor disease progression by enhancing the retinal accumulation of vasoinhibins promoting the hyperoxia-induced loss of blood vessels that leads to the excessive retinal angiogenesis that characterizes the disease.

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145. ALTERED CELLULAR COMMUNICATION MEDIATED BY NUCLEOTIDES IN CCl4-INDUCED HEPATIC FIBROSIS

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Hepatic fibrosis is characterized by an excessive accumulation of extracellular matrix components as a result of chronic cellular damage. In response, liver cells release pro-inflammatory signaling molecules, resulting in a continuous state of inflammation and aberrant scarring that drives the liver into a fibrotic state. One of
the signaling molecules involved in the regulation of inflammatory responses is extracellular ATP, through
the activation of purinergic receptors. However, the role of purinergic communication on fibrotic processes
in the liver is not well understood. We hypothesized that ATP could act as a promoting-damage mediator in
the onset of this pathological state. Thus, we administrated carbon tetrachloride (CCI4) or vehicle (corn oil)
during 4 weeks as a model of early hepatic fibrosis in C57BL6 mice of 6 weeks of age. After demonstrating
the establishment of fibrosis through molecular and histological techniques, we proceeded to identify
several types of purinergic receptors by quantitative polymerase chain reaction (qPCR). Primary cultures of
hepatocytes were obtained from both groups and cultures and, after 24 h, were stimulated with purinergic
agonists that included ATP, UTP and UDP (100 µM) during 5 min; then, we analyzed the phosphorylation
level of the extracellular regulated kinase (ERK) by Western blot. We found differential expression of the
mRNA of the receptors in the CCI4-induced fibrotic state, with P2YR2 and P2YR6 notably increasing their
relative expression in animals treated with the halogen, whereas P2YR13 and P2YR14 significantly reduced
their expression. Furthermore, we observed that the expression of the P2YR2 in the control group exhibited
central zonation, which is obliterated by the massive increase of its expression observed in the CCI4-treated
livers. Additionally, induction of phosphorylation of ERK was almost 2 and 3 times greater for ATP and UTP,
respectively, in the fibrotic group compared with the control group. On the other hand, UDP exhibited ability
to phosphorylate ERK only in the halogen-treated group.
These results suggest that the activation of certain purinergic receptors, i.e. P2Y2 or P2Y6, that have a
high affinity for UTP and its metabolites, is related to the establishment of hepatic fibrosis. However, these
interesting possibilities should be further investigated.

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146. EXPRESSION OF µ, κ AND δ-OPIOID RECEPTOR GENES AFTER PACED AND NON-PACED
MATING IN THE mPOA, THE VMH AND THE AMG IN THE FEMALE RAT

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Abstract: Rewarding behaviors are more likely to be repeated in the future by an animal. In the case of
mating, such behaviors are important for reproduction and therefore, species survival. The studies about
the rewarding properties of mating in different species have indicated that the endogenous opioid system is
one of the most relevant mediators in both sexes, exerting their actions through three main receptors: µ, κ
and δ, in brain areas that regulate sexual behavior. For females, current studies are conducted in rats under
two mating conditions, paced or non-paced, depending on the female’s ability to control or not the sexual
interaction. The administration of the non-specific opioid receptor antagonist, naloxone in relevant areas for
expression of sexual behavior, such as the medial preoptic area (mPOA), the ventromedial hypothalamus
(VMH) and the amygdala (AMG), blocked the sexual reward state after paced mating in female rat, suggesting
that there is an endogenous opioid release responsible for the reward state after paced mating. Sexual
reward can induce plastic changes on the brain and these changes might be more robust with repeated
mating. There are two aims in the present study. First, to analyze the expression of the µ-opioid receptor
gene at 4, 12 or 24 h after one mating session, in brain areas implicated in the control of female sexual
behavior such as the mPOA, the VMH and the AMG. We also evaluated if there are differences in µ, κ, and
δ-opioid genes expression, in the aforementioned brain regions after four mating sessions, and between
females that paced and did not paced the sexual interaction.
Results: There are no differences between all the groups analyzed; it is possible that the stimuli received by the female during mating are not sufficient to induce robust changes in gene expression in the brain areas studied and/or postranscriptional mechanisms regulate responses after repeated mating.

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147. PHYSICAL THERAPY PROGRAM EFFECTS FOR PREVENTION FALLS IN ELDERLY PATIENTS

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Introduction: Falls in the elderly are one of the major geriatric syndromes and one of the most important sources of morbidity and mortality. In most cases, they do not respond well to new environments becoming a serious public health concern. Therefore, the prevention of this geriatric syndrome is vital from a public health perspective. It is better to invest in the prevention in order to avoid as much as possible the presence of falls and to improve the quality of life in geriatric patients, such measures will avoid higher costs of treatment. Physiotherapy intervenes as a function of different fall prevention programs; its main objective is to avoid the occurrence of falls within the elderly.

Objective: To evaluate the effectiveness of a physiotherapy program to prevent falls in older adults.

Methods: A prospective, longitudinal, quasi-experimental study was conducted with 21 older adults belonging to the Geriatric Center in the city of Uriangato. A physical therapy program was applied for 17 weeks, including a geriatric assessment of elderly skills and daily activities like independent walking, lower limb muscle strength, quality of life and balance.

Results: After treatment, only one patient presented a fall caused by external factors. Functional evaluation showed statistically significant improvement in the number of falls (p=.0001), gait (p=.0001), and balance (p=.0001), as well as the quality of life (p=.0001).

Conclusions: A fall prevention program in the elderly based on physical therapy improves balance, gait and general functionality as it decreases the frequency of falls and improves the quality of life. L

148. OLFACTORY STIMULATION MODULATES EPILEPTIFORM ACTIVITY

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The olfactory bulb (OB) is the first central relay for processing olfactory stimuli, which maintains connections with brain structures involved in temporal lobe epilepsy, such as the hippocampus (HIP). OB disturbances may induce epilepsy, whereas OB ablation also causes epilepsy. Despite this evidence, the effect of acute olfactory stimulation (AOS) on epileptiform activity (EA) is still unclear. On the other hand, chronic olfactory stimulation, also called olfactory enrichment (OE), consisting of daily exposure to different odors, produces beneficial effects on several neurological pathologies, such as Alzheimer’s disease, anxiety and depression.
However, the effects of OE on EA have not been explored. Here, we evaluated the effect of AOS and OE on the susceptibility to develop EA in vivo and in vitro. Adult CD1 mice were subjected to OE, which consists of passive exposure to 21 different odors, 1 odor per day. Thereafter, the animals were administrated with repetitive subconvulsive doses of pentylenetetrazole (PTZ) to induce EA. To study the effect of AOS on EA, the animals were exposed to amyl-acetate during PTZ administration. For the in vitro experiments, animals were euthanized to obtain OB and HIP slices. Extracellular recordings were performed in the mitral cell layer of the OB and in the pyramidal cell layer of ventral HIP, during spontaneous and epileptiform-evoked activity. Our results show that animals exposed to OE and AOS showed greater susceptibility to develop generalized EA and a higher propensity to exhibit status epilepticus. The spontaneous activity of the animals exposed to OE showed a decrease in the OB and an increase in the HIP, mainly in high frequency bands. The EA was more severe in both brain structures in animals exposed to OE.

We conclude that OE and AOS enhance the susceptibility to develop EA, possibly by increasing the OB coupling with temporal lobe structures involved in the development of seizures, such as the HIP.

149. HISTOLOGICAL CHANGES IN THE CENTRAL NERVOUS SYSTEM IN AN EXPERIMENTAL MODEL OF HYPERAMMONEMIA INDUCED BY PORTOSYSTEMIC SHUNT: THE ROLE OF HYPOXIA

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Background: The astrocytic damage caused by hyperammonemia and the microglia activation have been described extensively as the main changes responsible for the pathogenesis in hepatic encephalopathy (HE). However other physiopathological phenomena have also been observed, such as hypoxia, which has received less attention. The main mechanisms proposed as the cause of neuronal death in HE are: increased lactic acid, reactive oxygen species and excitotoxicity. These changes are similar to those found in pathologies associated to impaired cerebral blood flow such as stroke or brain trauma. It has been shown that acute hepatic failure alters the autoregulation of the brain, even though the underlying molecular mechanisms are not well known in chronic HE. The main goal of this study was to describe the histologic changes in the brain of rat models with HE induced by portosystemic shunting (PS).

Methods: A control group of 10 Wistar rats without PS (sham-operated) and an experimental group of 31 with PS of 10-13 weeks were studied and compared. The brain was extracted and processed with paraffin and stained with hematoxylin and eosin for further histological analysis.

Results: Hypoxic changes were found in the experimental group. The most affected areas were the brain cortex and CA1 and CA2 of the hippocampus. Spongiform changes were found in the depth of cerebellar sulci. Some Alzheimer type II astrocytes were found in the cortex. A vacuolar degeneration of neuronal nuclei was found in both groups along with neuronal basophilic hyperchromasia.

Conclusions: The systemic changes induced by PS generated changes that highly suggest a hypoxic process affecting mainly the cortex and the hippocampus, as well as and a significant degeneration of the cerebellum. These findings support the hypothesis of hypoxia playing a major role in hyperammonemia associated to experimental HE.

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150. THROMBIN CLEAVES PROLACTIN TO GENERATE VASOINHIBINS

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Vasoinhibins are a family of antiangiogenic peptides derived by the specific cleavage of prolactin (PRL) by proteases including cathepsin D, matrix metalloproteases, and bone morphogenetic protein-1. Vasoinhibins also have profibrinolytic effects. Thrombin is a serine protease that promotes clot formation by converting soluble fibrinogen into insoluble fibrin. The eventual dissolution of fibrin clots is needed to restore blood flow and for wound healing. Here, we show that thrombin cleaves PRL into fragments that may correspond to vasoinhibins and, thereby, that vasoinhibins may be generated during the coagulation process to regulate hemostasis. The incubation of either human or bovine PRL with thrombin generated N-terminal fragments of ~6 and ~11 kDa and C-terminal fragments of ~11 and ~16 kDa, as revealed by Western blots probed with monoclonal anti-PRL antibodies. Mass spectrometry analysis of the bovine PRL fragments revealed a thrombin cleavage site between R103 and G104 that generated an N-terminal fragment of 11.697 kDa and a C-terminal fragment of 10.986 kDa. Also, a cleavage site between K48 and G49 was identified able to generate the N-terminal ~6 kDa and the C-terminal ~16 kDa fragments. The thrombin cleavage site at R103-G104 is conserved in both bovine and human PRL. However, the K48-G49 bovine PRL cleavage site is ahead of the respective one in the human PRL molecule (K53-A54). Of note, human PRL was preferentially cleaved to the 6 and 16 kDa fragments compared to the bovine PRL molecule. The N-terminal end of PRL appears to be necessary for the antiangiogenic properties of vasoinhibins. Evaluating the vascular and profibrinolytic effects of the PRL fragments generated by thrombin will help elucidate the contribution of vasoinhibins to hemostasis and the structure-function relationship of these peptides.

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151. NEURONAL CORRELATES IN THE COMPREHENSION OF METAPHOR IN HISPANOHABLANTES ADULTS

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One of the modalities of verbal communication is figurative language, a linguistic phenomenon in which the literal meaning of an expression is not what the speaker wants to transmit (Bohrn, Altmann & Jacobs, 2012). The term conceptual metaphor refers to the mental operation by which we apply the knowledge we have about a concrete conceptual domain to a more abstract conceptual domain (Lakoff & Johnson, 1980). It has been suggested that metaphors need more time to be understood than literal expressions (Gibbs et al., 1989, McGlone et al., 1994). Neuroimaging studies have also found greater activation of the brain during metaphor processing in contrast to literal and absurd stimuli, suggesting the recruitment of more neural resources to understand the metaphor (Bohrn, Altmann, & Jacobs 2012; Rapp, Mutschler, & Erb, 2012). However, it is still not clear which are the cognitive processes and neuronal correlates that underlie metaphoric comprehension. Our research aims to find which cognitive and neural regions are related to the comprehension of metaphorical, absurd and literal sentences in Spanish-speaking adults. The present study consisted of two phases. The first, consisted in constructing and validating a behavioral battery of stimulus
(sentences), previously evaluated by experts in linguistics, in a sample of 116 subjects. Subsequently, selected linguistic stimuli were presented to 44 subjects using a psychophysics software (Psychopy) that allowed the evaluation of reaction time, as well as the development of an experimental paradigm suitable for use in the magnetic scanner.

The second phase consisted in characterizing the maps of brain activation obtained while reading metaphorical, absurd and literal sentences by means of functional magnetic resonance imaging in 26 volunteers, and their relationship with psychological and cognitive tests. The results of the first phase demonstrated significant differences in behavior and reaction time between literal, absurd and metaphorical sentences, the second phase showed that cerebral activation during reading of metaphorical sentences is bilateralized, with greater recruitment of cortical structures and regions that have been associated with the extended language network.

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152. CHARACTERIZATION OF THE CONNECTIVITY OF NEONATES WITH INTRAUTERINE GROWTH RESTRICTION BASED ON DIFFUSION IMAGE.

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Infants with intrauterine growth restriction (IUGR) are premature newborns with a weight below the 3 percentile at birth. These children are born with an immature brain and usually present attention and motor dysfunction. In diffusion technique images, one of the most affected tracts is the corticospinal tract (CST). Currently, at the Unit of Neurodevelopment of the INB (UNAM), a neurohabilitation program based on Katona therapy is carried out, from the first two months of life. The purpose is to prevent the establishment of brain lesions in this population. Clinically, these children show an improve in their neurodevelopment with the course of the treatment.

Objective: To study the anatomical brain maturation of these children during the first year of life, using the Diffusion Weighted Images (DWI) by means of tractography. To correlate these results with the clinical neurodevelopment as a possible outcome of the neurohabilitation program.

Methods: Longitudinal DWI studies with value b = 0, 1000 were acquired in infants of 6 and 12 months of corrected age (CA). The CST is reconstructed by means of tractography using the spherical deconvolution model (CSD). The posterior limb of the internal capsule (PLIC) is quantitatively analyzed by calculating the Fractional Anisotropy (FA) and Media Diffusivity (MD).

Results: In a sample n = 5, values of FA = 0.4413 and FA=0.560981 were obtained for 6 and 12 months of CA respectively.

Conclusion: The values indicate an increase in FA, which leads to the proposition that a complex rearrangement of the CST, as well as an axonal maturation, is being performed.

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