2ⁿᵈ Symposium for Neuroscience students of Bordeaux

CGFB – University of Bordeaux, 15th June 2016

9:00   Presentation of Master 2 teaching units

11:00   Coffee break

11:30   Master students talks
(Maïena AINCY, Effie SEGAS, Maëlys BOMPART, Fanny CASSE)

12:30   Lunch break

14:00   "How to build synapses: trans-synaptic interactions instruct synaptogenesis" by Thomas Biederer
Leader of "Molecular mechanisms of synapse formation" team, Tufts University School of Medicine (Boston, USA)

15:00   Master students talks
(Maïtena LABEYRIE, Elric COURTY)

15:30   Coffee break

16:00   Master students talks
(Maxime HOUTEMAKER, Océane ANDRAUD, Elodie LEVY)

17:00   Best talks prices

Maiena AINCY

Characterization of the functional connectome of globus pallidus neurons.
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IMN, UMR 5293 CNRS, Université de Bordeaux, France.

Motor control and motor learning are functions coded by a subcortical network called basal ganglia (BG). This network is composed of the following anatomical areas: the striatum, the external and the internal globus pallidus, the subthalamic nucleus, the substancia nigra *pars compacta* and *pars reticulata*. According the classical anatomo-functional model, the external globus pallidus (GPe) is a simple relay nucleus. However, studies performed recently suggest that it is definitely a central component of the BG network, composed of two distinct neuronal populations: prototypic (Pro) and arkypallidal (Ark) neurons. While Pro and Ark efferent projections have already been characterized, the specific afferent connections coming from the striatum remain unknown. To address this question we selectively expressed channel rhodopsins in direct and indirect pathway striatal projection neurons using Cre-dependent viral expression strategies and studied synaptic transmission in the GPe in acute brain slices. We report a powerful inhibition from indirect medium spiny neurons (iMSN) on the Pro GPe neurons while Ark GPe neurons seem to not receive any inputs from this pathway. Furthermore, inhibition of the Pro GPe neurons by the incoming axons of iMSN elicited a disinhibition of the Ark neurons. Taken together our findings establish that Pro and Ark neurons are differentially wired by the striatum which suggest different implications in motor control and learning.

Effie SEGAS

Emotional Intelligence in first ever stroke: impact on post-stroke psychological distress and links with lesion site.
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Depression and anxiety are common post-stroke psychological outcomes and seem to have a great impact on recovery. Studying factors that can lead to the occurrence of these difficulties is of great interest for post-stroke rehabilitation. One factor that could trigger post-stroke depression and/or anxiety is poor emotional intelligence (EI) skills. Little is presently known on the links between a specific lesion site and the level of EI. Furthermore, the link between EI and post-stroke core symptoms of depression and/or anxiety remains unknown. Here, sixty first-ever stroke patients completed scales measuring perceived EI, anxiety and depression symptoms and underwent clinical MRI. They were also screened using a semi-structured interview (the Mini-International Neuropsychiatric Interview) in order to diagnose post-stroke psychiatric disorders. EI scores were first related to anxiety and depression scores. Moreover, we observed a link between specific lesion locations and lower levels in different dimensions of the EI construct. Specifically, our results showed that lower scores in the ability to pay attention to one's emotion are related to left hemispheric lesions relative to right hemispheric ones, and to left temporal lobe lesions relative to right ones. Lower scores in clarity, the capacity to discriminate and understand emotions, were associated with lesions in the parietal lobe (relative to lesions elsewhere), as well as with lesions in the left insula relative to lesions in the right insula. Finally, patients with occipital lesions (relative to lesions elsewhere) reported lower ability to regulate their emotions (Reparation). These results may help clinicians to identify the patients at higher risk to develop post-stroke depression and/or anxiety and to propose more personalized therapeutic programs.

Maëlys BOMPART

Detection of early motor alterations in a Alzheimer's disease mouse model, with a new behavior phenotyping tool.
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La maladie d'Alzheimer est une maladie neurodégénérative dont les causes sont encore mal connues. Le diagnostic se base sur le déclin cognitif, qui correspond à une phase déjà avancée de la pathologie. La recherche de signes précoces est indispensable pour déterminer les causes de cette maladie, et pouvoir prévenir l'apparition de dommages irréversibles.

A l'aide d'une plateforme équipée de détecteurs de pression très sensibles, nous avons pu mettre en évidence la présence de tremblements internes (frissons) chez des souris de la lignée 3xTG, modèle de la maladie d'Alzheimer. Ces frissons sont détectés pendant les périodes d'activité mais aussi de sommeil, et ce dès l'âge de 21 jours, soit bien avant l'identification des troubles cognitifs rapportés dans la littérature. Nous avons également mis en évidence une altération de la locomotion, observée déjà à l'âge de 21j et qui s'aggrave avec l'âge.

Ces résultats suggèrent la présence de symptômes moteurs précoces dans la maladie d'Alzheimer. Dans la mesure où les atteintes motrices précoces sont actuellement peu prédictives du type de pathologie (entre Alzheimer et Parkinson par exemple), la recherche d'une signature spécifique de troubles moteurs permettant une détection précoce et spécifique de la maladie d'Alzheimer est d'une grande pertinence clinique.

Fanny CASSE

Morphological analysis of dendritic spines in the dentate gyrus in a mouse model cKO-Vangl2.

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Planar polarity pathway involves in the implementation of the cytoskeleton played a role in the development and morphology of dendritic spines (Montcouquiol et al., 2006; Goodrich, 2008). Vangl2 a heart protein planar polarity, is located in the dentate gyrus and particularly present at dendritic spines. This suggests a role Vangl2 in the establishment and dynamics of dendritic spines. To test this hypothesis, in mice deleted in Vangl2 we injected a lentivirus to mark the granule cells of the dentate gyrus with extensions in the inner molecular layer. After immunohistofluorescence, counting filopodia and different types of spines has determined that Vangl2 plays a role in dendritic spine morphology in the inner molecular layer of the dentate gyrus.

Maïtena LABEYRIE

Assessment of polyphenols effects on cognitive decline in healthy elderly people.
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Current population is aging. Age-related cognitive decline is known to cause a loss of autonomy in the elderly, and as such is a major public health problem. It is therefore necessary to define prevention tools. Innovative approaches have emerged in recent years, highlighting the role of diet on cognition. Recent studies on animals within the NutriNeuro laboratory show that grape and blueberry polyphenols have a beneficial effect on memory during aging. Based on these data and literature, a blend of extracts rich in polyphenols from grape and blueberry was developed to prevent age-related cognitive decline. A clinical study of nutritional intervention has been implemented for a group of 60–70 year old people, in good physical and mental health, consuming, or not, this plant extract for six months. Episodic memory (PAL test), as well as working memory (VRM test), were investigated with these subjects before and after the six months of supplementation. The results obtained show that administered polyphenols have a beneficial effect on the memory of the subjects who showed at the beginning of the study, the memory episodic scores assessed with PAL, the lowest. The mixture of polyphenols also helped to significantly improve the performance measured with the VRM test, of all subjects regardless of their basal level. The product would therefore have a positive effect on memory.

Elric COURTY

Interaction of vestibulospinal and lombo-thoracic commands in the dynamic control of posture.
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Postural control is one of the main components of equilibrium. This dynamic phenomenon is driven by reflex sensitive-based control systems and by locomotor systems. Previous studies showed the presence of a dual control system on the axial postural motoneurons of the juvenile frog *Xenopus laevis*. The first system is the vestibular system, encoding movements and positions of the body in space. The second is the lumbar central pattern generator (CPG) responsible for the propulsion during locomotion. The present study confirms that the vestibular system is directly responsible for maintaining the static posture after a positional change. Moreover, our results further show that the vestibular system can also assure a dynamic postural control, in response to passive movements, by indirect pathways implicating the lumbar CPG. However, during locomotor episodes the commands arising from the lumbar CPG take the control of posture over descending vestibular commands.

Maxime HOUTEMAKER

Characterization of endocannabinoid modulation of activity in the anterior piriform cortex usingvoltage-sensitive dye imaging.
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The olfactory system is often neglected as guiding sense in daily human life, while in fact many of our actions may be modulated by smell. The main olfactory cortex is the Piriform Cortex (PC), and can be divided into the anterior and posterior PC. The anterior PC (aPC) contains mostly afferent inputs from the olfactory bulb, likely allowing the aPC to encode odor identity. Projections from the PC to the olfactory bulb have been reported to be subject to endocannabinoid modulation, via the cannabinoid type-1 (CB-1) receptor. Given that pyramidal neurons in the aPC make associational connections with to other PC pyramidal neurons, and unpublished results showed that the majority of glutamatergic neurons express CB-1 receptor mRNA, it seems likely that neural activity in the PC may be modulated by endocannabinoids. In the present study, we used voltage-sensitive dye imaging (VSDi) to characterize endocannabinoid modulation of stimulation-evoked neural activity in different regions of interest within the aPC. The evoked VSDi signal was found strongest in layer II and III of the cortex and was increased after disinhibition using $GABA_A$ receptor blockers. However, application of CB-1 receptor agonists or inverse antagonists was not found to modulate the recorded activity in the anterior PC.

Océane ANDRAUD

Influence of low-grade inflammation on depressive symptoms in obese subjects.
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Obesity is characterized by an excessive or abnormal increase of body-fat, together with a systemic low-grade inflammatory state, which is reflected by increased concentrations of circulating inflammatory factors including pro-inflammatory cytokines. This low-inflammatory grade originates in part from adipocytes, which produce adipokines and pro-inflammatory cytokines. Moreover, obesity is associated with an increased risk of neuropsychiatric comorbidity, including depression. Increasing amounts of data support the implication of inflammatory processes in pathophysiology of depression but the mechanisms involved in the relationship between obesity and depressive symptomatology still unknown. The main aim of this study was to assess the influence of adiposity-related low grade inflammation on depressive symptoms in severely obese subjects.

Elodie LEVY

Implication du striatum dans le processus de prise de décision par apprentissage.
Levy E., Daisuke K., Boraud T.
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Many studies are interested in decision making and learning processes and in brain areas which are engaged in. Among them, the Pre-Frontal Cortex (PFC) implication and a sub cortical structures' network, the Basal Ganglia (BG) has been shown. But, the precise role of each structure has not yet been really defined. However, two main hypotheses exist. Then, for prove one of them, we blocked BG influence on PFC by inhibiting the influence on their entire structure, the Striatum, with intracerebral Haldol injections in non-human primates performing a "two-armed bandit task".

Our results show that monkeys are able to do decision making after Striatum inhibition but they are unable to learn new values. These results confirm that, in non-human primates, BG and PFC are well involved as co-workers in one process: integrity of all the circuit is necessary for learning whereas only cortex is sufficient once the choice is in habitual context.