



SEMINARIO PRESENCIAL

Martes, 18 de Abril de 2023

12:30 h. Instituto Cajal (CSIC) Madrid

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SENSORY PROCESSING IN SUBCORTICAL NUCLEI

Abstract

If we think about any regular day, we are likely to perceive a plethora of sensory stimuli that are transmitted to the brain to generate an appropriate response. As studies have shown in the cortex, sensory processing can be modulated by motor activity in various ways. For instance, locomotion reduces the magnitude of auditory responses in the auditory cortex while enhancing visual responses in the visual cortex. The striatum, which is the main input nucleus of the basal ganglia, receives dense monosynaptic excitatory input from both somatosensory and motor cortices, suggesting that motor activity could also modulate sensory responses at the striatal level. However, how these sensorimotor interactions are represented in the striatum remains unknown. In this seminar, I will present our work using *in vivo* whole-cell recordings in awake mice in the dorsolateral striatum to study how tactile sensory integration is modulated by motor activity, and how such sensorimotor interactions are affected in a Parkinsonian mouse model.

Affiliation and short bio

I received my Ph.D. from the University Miguel Hernandez of Elche, Spain, under the supervision of Professor Asia Fernandez-Carvajal and Professor Antonio Ferrer-Montiel in 2016. In my thesis, we studied the activity and modulation of several ion channels from the TRP family responsible for the transduction of noxious stimuli (TRPV1, TRPM8, and TRPA1). We described potential analgesics for combating chronic pain using different electrophysiological techniques such as *in vitro* whole-cell patch clamp and microelectrode array recordings in the dorsal root ganglia neurons that led to three patents and multiple publications in high-impact journals.

Next, I joined as a postdoctoral researcher the Ramon Reig's laboratory at the Institute of Neuroscience of Alicante, Spain, in December 2016, where we studied the impact of dopamine on the modulation of sensory responses in the medium spiny neurons located in the dorsomedial striatum. This resulted in a manuscript currently in preparation.

In September 2017, I joined Gilad Silberberg's laboratory at Karolinska Institutet. Here, we studied sensory-motor interactions in the dorsolateral striatum of awake healthy and parkinsonian mice. Using the patch clamp recordings *in vivo* in behaving animals we showed that neurons respond to both sensory stimuli and spontaneous whisking and that sensory responses are attenuated by whisker-related motor activity. We also showed that in parkinsonian mice, dopamine depletion affected both sensory and motor striatal representations.

Currently, I study the claustrum, a small brain region implicated in a wide range of functions such as consciousness, regulation of cortical sleep waves and pain processing. Here, we combined *in vivo* multiunit silicon probe recordings in awake mice, *ex vivo* paired whole-cell patch clamp recordings, optogenetics and pharmacology to investigate the organizing principles and targets of claustrum projections to the anterior cingulate cortex.

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Related publications with the topic

de la Torre-Martinez, R.#, Ketzeff, M., and Silberberg, G#. (2023). [Ongoing movement controls sensory integration in the dorsolateral striatum](#). Nature communications (# co-corresponding author)

Sáez M, Alegre-Cortés J, Morgenstern Nicolás A., García-Frigola C, de la Torre-Martínez R, Reig R. Dopamine enhances visuo-tactile integration in the dorsomedial striatum. (Manuscript under preparation)

de la Torre Martinez, R.*, Chia, Z.*, Tokarska, A., Frost-Nylen, J., Augustine, G.J., and Silberberg, G. (2023). [Presynaptic and Postsynaptic Determinants of the Functional Connectivity Between the Claustrum and Anterior Cingulate Cortex](#). (* co-first author). bioRxiv. doi: <https://doi.org/10.1101/2023.03.23.533767>