19th National Meeting of the Spanish Society of Neuroscience

Sensorimotor integration by dorsal striatal circuits

The basal ganglia (BG) are involved in a wide range of function, such as planning, motor learning or selection of movements. Malfunctions of the BG can lead severe motor problems, as Parkinson¿s and Huntington¿s disease or Tourette syndrome. The striatum is the input layer of the BG and receives cortical projections from sensory, motor and associative areas and thalamus. The 95% of the striatal neurons are GABAergic projection neurons called MSNs. They are divided into two subpopulations according to their axonal projections and their different dopamine receptor expression, defining the direct and indirect pathway. In addition, the striatum is massively innervated by dopaminergic axons from the substantia nigra pars compacta. Dopamine is known to play a role in processes leading to corticostriatal synapses, modulating and inducing changes in synaptic transmission and plasticity. Axons from cortical sensory areas target MSNs and interneurons, some of these projections overlap along dorsal striatum, when transmitting; tactile, auditory and visual information. Therefore, in order to understand the circuits evolved, we first study the axonal innervation and the functional properties of the dorsal striatum. To asses our objectives, we combined in vivo optopatch-clamp recordings in identified MSNs along dorsal striatum with simultaneous local field potential recordings in several cortical areas in anesthetized mice. We found that dorsal striatum is composed by two non-overlapping functional circuits, with particular corticostriatal connectivity and local synaptic attributes of each region (Alegre-Cortés et al, 2020). We stablished that only MSNs located in the dorsomedial striatum are able to integrate information of different sensory modalities, such as visual and tactile. Then, we also investigated the impact of dopamine modulating multisensory integration in MSNs of the dorsomedial striatum. Our data shows that dopamine release modify the integration of visual and tactile inputs and selectively synchronizes multisensory information in a specific subpopulation of MSNs.