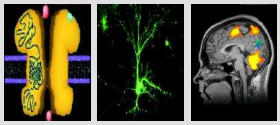

SENSORY ENCODING AND THE EMERGENCE OF MEMORY

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OXANA ESCHENKO

Department Computational Neuroscience, Max Planck Institute for Biological Cybernetics, Tübingen, Germany

The locus coeruleus saliency signaling affects sensory perception by increasing arousal

Saliency signaling is essential for the organism's survival. An alerting stimulus triggers various visceral and behavioral reactions, for example, pupil dilation, an eye blink, or a startle. These innate reflexes may initiate a more complex adaptive response such as orienting, exploration, or defensive behavior. Typically, the startle response is attenuated by pre-exposure to a non-startling stimulus and this phenomenon is known as prepulse inhibition (PPI). The PPI paradigm is broadly used for testing sensorimotor integration in animals and humans and as a diagnostic tool for mental fatigue and various neuropsychiatric conditions with disrupted sensorimotor processing, such as schizophrenia, attention disorder, or autism. The locus coeruleus (LC) neurons respond to salient stimuli and noradrenaline (NA) release affects sensory encoding, and most likely perception. To modulate the LC phasic response, we applied direct electrical stimulation of the LC before a startling sound presentation in spontaneously behaving rats. The LC phasic activation attenuated the acoustic startle response. The startle amplitude scaled with stimulation intensity and 100 Hz-stimulation for 100 ms mimicked pre-exposure to a non-startling tone (prepulse). The LC activation caused EEG desynchronization indicative of cortical arousal. We speculate that the reduced startle response was due to increased arousal level. Indeed, high vigilance state was associated with a smaller startle response. The noradrenergic modulation could target both the brainstem and spinal circuits mediating sensorimotor gating and result in an attenuated motor response. The LC diffuse ascending projections may affect the excitability within the saliency network leading to a change in perception of the stimulus intensity.