Hunter College of the City University of New York
Department of Biological Sciences
Fall 2023 Inga Richter Seminar Series

All Seminars are held on Mondays via ZOOM or in person at 12:30PM.

This seminar will be held IN PERSON

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Department of Biomedical Engineering
Columbia University

The effects of locus coeruleus stimulation in health and disease: from enhancing sensory processing to reducing amyloid plaques

Summary: The locus coeruleus (LC) is a critical brain structure and provides the primary source of norepinephrine (NE) to the forebrain. The LC also projects widely throughout the brain and modulates numerous brain functions through a variety of adrenergic receptors. In Alzheimer's disease (AD) it is the first brain structure to show characteristic pathology, decades before symptom onset. We investigated the previously unknown effects of LC activation on thalamic sensory processing through reverse correlation analysis of single-unit recordings from different stages of the rat vibrissa pathway. LC activation increased thalamic feature selectivity, resulting in a drastic improvement in information transmission. We found this improvement was dependent on both local activation of α-adrenergic receptors and modulation of T-type calcium channels in the thalamus. LC-NE optimization of thalamic sensory processing is also critical to perception as LC activation increased the perceptual sensitivity of animals performing tactile discrimination tasks, and this improvement was blocked when NE effects in the thalamus were pharmacologically precluded. Moreover, I will discuss the effects of long-term LC stimulation on amyloid pathology and memory function in an AD mouse model. Our preliminary results indicated that long-term LC stimulation was able to delay memory deterioration and reduce the size of amyloid plaques in an Aβ model of AD. Lastly, to translate the potential technology to humans, we tested the possibility of using peripheral neural stimulation to surrogate direct LC stimulation. Taken together, these results suggest the neural stimulation targeting the LC-NE system is an effective means not only to enhance neural information processing, but also to delay the progression of AD.

Monday, September 18, 2023
12:30pm
Hunter College
In-person
Host: Maria Figueiredo-Pereira, PhD