Spring 2021

Seminars in NEUROSCIENCE

Presented by the WVU Department of Neuroscience & WVU Rockefeller Neuroscience Institute
Co-hosted by the C. Eugene Bennett Department of Chemistry

"Neurochemical characterization of striatal function: from new electroanalytical tools to new insight"

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The brain is a dynamic environment in which neurochemicals rapidly fluctuate over time and space. Neuroscientists endeavor to understand exactly how specific chemical signals integrate into complex brain function (or dysfunction). To date, progress has been limited by a paucity of tools available for monitoring real-time neurochemical signaling in active subjects. One of the available tools is fast-scan cyclic voltammetry (FSCV), an electroanalytical approach that combines selectivity with sensitivity to report on dopamine (DA) dynamics in the brain. FSCV has profoundly advanced our understanding of goal-directed behavior, but this powerful voltammetric approach has primarily been used to study DA. Countless classes of molecules in the brain remain entirely uncharacterized. The Sombers Lab is working to expand real-time electroanalytical measurements to additional neurochemical targets and reveal how different neurochemicals contribute to striatal function and dysfunction. This talk will describe breakthrough voltammetric strategies for monitoring (1) hydrogen peroxide (H_2O_2), a reactive oxygen species; and (2) met-enkephalin (M-ENK), an endogenous opioid neuropeptide. These two 'difficult-to-detect' neurochemicals work with DA in the striatum, a central hub of the basal ganglia that is involved in motor control and motivated behavior. These investigations reveal critical mechanistic details by which neurochemical encoding of information in the striatum relates to specific aspects of action initiation and reward-related decision making. Perhaps more importantly, this work provides the broader scientific community with well characterized research tools that can be used to investigate how the brain uses neurochemical signaling to encode information in a variety of contexts, to quantify the modulatory effects of relevant pharmacology, and to directly evaluate neurochemical dysregulation in a range of disease states.

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