



MARKITA LANDRY

University of California, Berkeley
Department of Chemical and Biomolecular Engineering
Chan-Zuckerberg Biohub Investigator
landry@berkeley.edu

Understanding Brain Neurochemistry: Imaging Neuromodulators with High Spatiotemporal Resolution

Abstract

Dopamine neurotransmission plays a critical role in brain function in both health and disease and aberrations in dopamine neurotransmission are implicated in several psychiatric and neurological disorders, including schizophrenia, depression, anxiety, and Parkinson's disease. Until recently, measuring the dynamics of dopamine and other neurotransmitters of this class could not be achieved at spatiotemporal resolutions necessary to understand how dopamine regulates the plasticity and function of neurons and neural circuits, and how dysfunctions in this regulation lead to disease. Probes that satisfy critical attributes in spatial and temporal resolution, and chemical selectivity are needed to facilitate investigations of brain neurochemistry.

Both selectivity and imaging challenges contribute challenges in neuromodulator imaging, requiring parallel developments in probe development and microscopy. Thus, I review challenges in, and recent developments towards, development of optical probes to image neuromodulator dopamine in the brain. Specifically, I discuss protein-based dopamine probes and synthetic nanoparticle-based probes that have provided unprecedented access to imaging neuromodulation at the level of individual synapses in both health and disease. Lastly, I discuss possibilities for exploration of the effects of receptor agonists and antagonists commonly used as psychiatric drugs.

Bionote

Markita Landry is an assistant professor in the department of Chemical and Biomolecular Engineering at the University of California, Berkeley. She received a B.S. in Chemistry, and a B.A. in Physics from the University of North Carolina at Chapel Hill, a Ph.D. in Chemical Physics and a Certificate in Business Administration from the University of Illinois at Urbana-Champaign, and completed a postdoctoral fellowship in Chemical Engineering at the Massachusetts Institute of Technology.

Her current research centers on the development of synthetic nanoparticle-polymer conjugates for imaging neuromodulation in the brain, and for the delivery of genetic materials into plants for plant biotechnology applications. The Landry lab exploits the highly tunable chemical and physical properties of nanomaterials for the creation of bio-mimetic structures, molecular imaging, and plant genome editing. She is also on the scientific advisory board of Terramera, Inc. She is a recent recipient of early career awards from the Brain and Behavior Research Foundation, the Burroughs Wellcome Fund, The Parkinson's Disease Foundation, the DARPA Young Investigator program, the Beckman Young Investigator program, the Howard Hughes Medical Institute, is a Sloan Research Fellow, an FFAR New Innovator, and is a Chan-Zuckerberg Biohub Investigator.