

A generalizable strategy to image neurotransmitters with vibrational spectroscopy of isotopologues

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Abstract

Chemical neurotransmission is central to brain activity, where aberrations thereof lead to psychiatric or neurodegenerative disorders. The time and length scales over which neurochemical signaling occurs can differ between neurotransmitters, and is not always correlated with neuron electrical activity. Herein, we demonstrate a new, non-perturbative approach based on vibrational microscopy to image neurotransmitter isotopologues for dopamine and GABA, and demonstrate that these neurotransmitter isotopologues enable direct imaging of neurotransmitters in neuronal cells. This method is generalizable to other neurotransmitters, neuromodulators, and neuropeptides, providing a generic toolkit for imaging neurochemistry.