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A Dynamic Analysis of Secretory Granules Containing Proteins Involved In Learning LOUIS PRAHL, ALEX SIMON, CONOR JACOBS, AUDREY FULWILER, LINDSAY HILKEN, BETHE SCALETTAR, JANIS LOCHNER, Lewis & Clark College — Formation and encoding of long-term memories requires a series of structural changes at synapses, or sites of neuronal communication, in the hippocampus; these changes are mediated by neuromodulatory proteins and serve to strengthen synapses to improve communication. Two prominent neuromodulators, tissue plasminogen activator (tPA) and brain-derived neurotrophic factor (BDNF), are copackaged into secretory granules (SGs) in the body of nerve cells and are transported to distal synapses by motor proteins. At synapses, particularly presynaptic sites, the fate of tPA and BDNF is largely unknown. Motivated by this, and by recent data implicating presynaptic BDNF in early phases of learning, we used fluorescence microscopy to elucidate dynamic properties of presynaptic tPA and BDNF. We find that presynaptic SGs containing tPA and/or BDNF undergo Brownian and anomalous diffusive motion that, in 75% of cases, is so slow that it typically would be classified as immobility. These results suggest that tPA and BDNF are retained at presynaptic sites to facilitate their corelease and role in learning.

Bethe Scalettar
Lewis & Clark College

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