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MEETING ABSTRACT

A10.1
Illuminating axonal gatekeepers of dopamine transmission
Stephanie J. CRAGG*, Sarah THRLEFFEL, Polina KOSILLO and Yan-Fen ZHANG
Department of Physiology, Anatomy and Genetics, University of Oxford, United Kingdom

Dopamine transmission in the mammalian striatum is critically involved in the selection of actions by the basal ganglia. Dysregulation of dopamine underlies a range of psychomotor disorders, including addiction and Parkinson’s disease. Dopamine neurons form extensive axonal fields, and it is becoming clear that a variety of local mechanisms within striatum and on dopamine axons are of fundamental importance in determining dopamine transmission. Axoaxonic inputs from striatal cholinergic interneurons to nicotinic receptors on dopamine axons may be particularly important. Striatal cholinergic interneurons function as a synchronized network showing phasic changes in neuron activity that are time-locked to those in dopamine neurons, suggesting key interactions. The advent of optogenetic techniques has enabled us to address directly the effects of striatal inputs, including cholinergic inputs to dopamine axons, in determining dopamine transmission. We show for example that cholinergic interneurons and their inputs can directly trigger axonal dopamine release, bypassing activity in dopamine neurons. This axoaxonic control can even override activity in dopamine axons, and can also provide a clamp that suppresses the frequency response of dopamine signals. This axonal triggering and gating of dopamine transmission could place axoaxonic gatekeeping mechanisms as central to dopamine function.

*Submitting author e-mail: stephanie.cragg@dpag.ox.ac.uk