Fluctuations in the release of dopamine (DA) play an important role in reward learning, motivation, motor control, and cognition. Dysregulation of dopaminergic neurotransmission is associated with several diseases including Parkinson’s, schizophrenia, attention deficit hyperactivity disorder (ADHD), and restless legs syndrome (RLS). Dopaminergic cell bodies are primarily found in the substantia nigra and ventral tegmental area (VTA), the latter of which projects to the nucleus accumbens (NAcc) via the medial forebrain bundle (MFB) and has been shown to be particularly important for the control of goal-directed behavior. Dopamine neurons have two characteristic modes of firing, phasic and tonic. Phasic firing of DA neurons (~20 Hz) underlies rapid, transient dopamine release (milliseconds) produced by burst firing of DA neurons, whereas tonic firing (~5 Hz) leads to changes in dopamine concentrations on longer timescales (seconds to minutes).

Addictive drugs change the phasic characteristics of dopamine activity in reward signaling and the tonic function of dopamine levels in facilitating a wide variety of motor and cognitive functions. Identification of the role of DA signaling in discrete behavioral, motivational, and cognitive processes necessitates a technology with the capacity for capturing the multiple modes of DA neurotransmission. Fast-scan cyclic voltammetry (FSCV) is a real-time electrochemical technique that can be used in vivo and in vitro to detect an electroactive neurotransmitter by its oxidative and reductive properties. We employed FSCV to examine the pharmacological modulation of electrically-evoked DA release in an animal model. We examined DA dynamics in the gestational (E17) methylazoxymethanol acetate (MAM) rat model of schizophrenia. We investigated the effects of amphetamine on dopamine release in these rats.

**FSCV Method & Principle**

When sufficient current is applied to the carbon-fiber microelectrode, dopamine is oxidized to dopamine-quinone and then reduced back to dopamine. Electrons are transferred between these molecules and the microelectrode. This flux is measured as a current proportional to the number of molecules undergoing electro-oxidation.

Dopaminergic cell bodies are primarily found in the substantia nigra and ventral tegmental area (VTA), the latter of which projects to the nucleus accumbens (NAcc) via the medial forebrain bundle (MFB). We target this pathway by stimulating the MFB.

**FSCV Probe Fabrication**

Carbon fiber (7µm diameter) Structural Epoxy

Fused Silica Tubing (outer diameter: 90 µm) Silver Epoxy

Wire Pin Connector

**FSCV No difference in DA release following administration of amphetamine in MAM rats and Sham rats**

Heat-map plot in a MAM animal. Changes in current flow is represented in color as a function of time (x-axis) and electrical potential (y-axis). Point numbers in the y-axis correspond to the voltage sweep in the triangular waveform. A cyclic voltammogram depicting changes in current as a function of voltage. This is consistent with the oxidation and reduction of dopamine.

Heat-map plot in a Sham animal. Changes in current flow is represented in color as a function of time (x-axis) and electrical potential (y-axis). Point numbers in the y-axis correspond to the voltage sweep in the triangular waveform. A cyclic voltammogram depicting changes in current as a function of voltage. This is consistent with the oxidation and reduction of dopamine.

**REFERENCES**


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