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MEETING ABSTRACT

A12.2
Investigating the heterogeneous effects of neuromodulators on striatal dopamine release: what is the role of the illusive striosome and matrix sub-territories?
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The striatum is organised not only topographically, but also biochemically, into striosomes and matrix compartments. Striosomes form patchy, labyrinth-like structures that are enriched in \( \mu \)-opioid receptors (MORs) and Substance P (SP) relative to the surrounding matrix, which is enriched in calbindin-D28K and acetylcholinesterase. Evidence for a third ring-like “annulus” or “peristriosomal” region surrounding striosomes, has been proposed from high met-enkephalin expression, and at least in primates, by overlap of NK\(_1\) receptors with their endogenous agonist SP. Despite being first described almost 30 years ago, the functional implications of this organisation are poorly understood. Dopamine transmission occurs throughout striosomes and matrix, and is reported to be modulated by SP. However, reported effects are conflicting, ranging from facilitation to inhibition. We addressed whether dopamine transmission is modulated differently in striosome/matrix compartments by SP.

We paired detection of electrically evoked dopamine release at carbon-fibre microelectrodes using fast-scan cyclic voltammetry in mouse striatal slices with post-hoc immunolabelling for MOR immunoreactivity to define striosomes. SP modulated dopamine release via NK\(_1\) receptors; however, the effect of SP on extracellular dopamine ranged from a 70% enhancement to 50% reduction. The direction of modulation was determined by location within the striosomal–matrix axis: Dopamine release was boosted in striosome centres, diminished in striosomal–matrix borders and unaffected in the matrix. These diametric effects of SP on dopamine release in striosome and boundary regions result in an apparent centre–surround contrast of striosomal dopamine signals. These data reveal that dopamine transmission can be differentially modulated within the striosomal–matrix axis, and furthermore, indicate a functionally distinct zone at the striosome–matrix interface which may have key impact on striatal integration.

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