

Dopamine modulates excitability of the projection neurons of the robust nucleus of the arcopallium (RA) in adult zebra finches

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The neural substrate of vocal learning in songbirds is an accessible system for studying motor learning and motor control in vertebrates. In the song system, the anterior forebrain pathway (AFP) is essential for song learning, and the vocal motor pathway (VMP) is necessary for song production. Two pathways gathered in premotor robust nucleus of the arcopallium (RA). RA receives dense dopaminergic innervation from the PAG and VTA, but the physiological functions of this projection remain unclear. In this study, we investigated the effect of dopamine (DA) on excitability of projection neurons in RA. We recorded from neurons in brain slices of adult zebra finches, using whole-cell recording techniques. We found that DA modulates excitability, which is increased by the D1 agonist, but not the D2 agonist, whereas either D1 or D2 antagonists can block DAergic effects on excitability. These results suggest that it is possible that the D1-mediated effects of DA depend on activation of D2 receptors. Such a synergistic action would be similar to effects observed in mammalian dorsal striatum.

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