Changes in extracellular levels of glutamate and aspartate in rat substantia nigra induced by dopamine receptor ligands: In vivo microdialysis studies

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Abstract

The microdialysis technique was utilized to study the local effects of D_1 and D_2 family type dopamine (DA) receptor (R) ligands on the in vivo release of endogenous glutamate (GLU) and aspartate (ASP) from rat substantia nigra (SN). Addition to the dialysis perfusion solution of either D_1-R and D_2-R agonists, such as SKF-38393 (50 and 100 μM) and Quinpirole (5 and 10 μM), resulted in dose-dependent increases in extracellular concentrations of GLU and ASP, respectively. The SKF-38393 and Quinpirole-induced effects were reduced by SCH-23390 (0.5 μM), a D_1-R antagonist, and by Spiperone (1.0 μM), a D_2-R antagonist, respectively. However, SCH-23390 and Spiperone did increase GLU and ASP extracellular concentrations. Local infusion with Tetrodotoxin (TTX) (1.0 μM), a blocker of voltage-dependent Na^+ channels, increased basal extracellular levels of GLU. In addition, co-infusion of TTX and SKF-38393 evoked increases in extracellular GLU levels higher than those observed after SKF-38393 alone. Finally, chemical lesions of nigral DA cells with 6-OH-DA increased the basal extracellular levels of GLU. It is proposed that the release of GLU and ASP from SN may be regulated by D_1- and D_2-receptors present in this basal ganglia structure. In addition, part of the D_1 receptors present in SN might be located presynaptically on GLU-containing nerve endings.