Clinical evidences suggest that dopamine (DA) D2/D3 receptor (D2/D3R) agonists have retarding effects on the progression of Parkinson's disease (Whone, 2003). Chronic exposure to the D2/D3R agonist 7-OHDPAT restores nigrostriatal pathway and locomotion in rats after 6-OHDA-induced damage.

In the present study we used primary cultures of mouse mesencephalic neurons to investigate the neurotrophic action of DA agonists such as quinpirole and 7-OHDPAT and the indirect DA agonists, such as amphetamine and cocaine on the dopaminergic neurons. Primary mesencephalic neuronal cultures from wild type and D3 KO mice were prepared at 12.5 day embryonal stage. Pharmacological tests were conducted after 5 days in vitro. Morphometric assessments showed that DA agonists produced a significant increase in maximal dendritic length, number of primary dendrites, and soma area in DA neurons when compared to vehicle. These morphological features were associated with biochemical changes, as indicated by a significant increase in ERK and AKT phosphorylation, which are known to be involved in neuronal plasticity. All these effects were completely blocked by pre-treatment with DA D3R antagonists SB-277011A and S33084, and were lacking in neuronal cultures from D3KO mice.

These data support the central role of D3 receptors in mediating the neurotrophic effects of DA agonists.