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Proteomic analyses reveal distinct roles for L DOPA and edaravone in protection of neurons against oxidative stress

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Parkinson's disease (PD) is the second most common neurodegenerative movement disorder caused by preferential dopaminergic neuronal cell death in the substantia nigra, a process also influenced by oxidative stress. L-3,4-dihydroxyphenylalanine (L-DOPA) represents the main treatment route for motor symptoms associated with PD. Although L-DOPA has no direct antioxidant function, L-DOPA itself may induce low level of oxidative stress that in turn stimulates endogenous antioxidant mechanisms. Conversely, 3-methyl-1-phenyl-2-pyrazolin-5-one (Edaravone) is a neuroprotective supplement that act as potent antioxidants protecting against oxidative stress and neuronal apoptosis. In this study we performed a two-dimensional gel electrophoresis (2DE)-based proteomic study to gain further insight into the mechanism in which L-DOPA or Edaravone can influence the toxic effects of H₂O₂ in neuronal cells. We observed that oxidative stress affects the metabolic routes as well as cytoskeletal integrity and that neuronal cells respond to oxidative conditions by enhancing numerous survival pathways. We further show that L-DOPA and Edaravone have distinctive effects in response to oxidative stress. Exposure to L-DOPA can aid hypoxia condition in cells and therefore induction of ORP150 with its concomitant cytoprotective effects. Edaravone appears to protect neuronal cells against oxidative stress via induction of Peroxiredoxin-2 and inhibition of apoptosis. Our study sheds light on the molecular interplay linking together oxidative stress, L-DOPA and Edaravone in neuronal cells.

Biography

Mohammad-Saeid Jami has a PhD in Molecular Biology and Biotechnology from the University of Leon (Spain). He has also been performing Post-doc researches since 2011. He is Assistant Professor at Shahrekord University of Medical Sciences, School of Medicine. He has published more than 12 papers in the field of molecular biology and has been serving as an Editorial Board Member of CCO and JMBR.

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