

## Alterations in the distribution of glutathione in the substantia nigra in Parkinson's disease.

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### Abstract

Depletion of reduced glutathione occurs in the substantia nigra in Parkinson's disease and in incidental Lewy body disease (presymptomatic Parkinson's disease) which may implicate oxidative stress in the neurodegenerative process. In this study mercury orange fluorescent staining and immunostaining with an antibody to reduced glutathione have been used to determine the distribution of reduced glutathione in the substantia nigra in Parkinson's disease compared with normal individuals. Mercury orange staining showed moderate background levels of fluorescence in the neuropil in both control and Parkinson's disease substantia nigra and localised reduced glutathione to the somata of melanized nigral neurons and glial elements of the neuropil. Neuronal nuclei revealed a relative lack of fluorescence after mercury orange staining. There was a significant depletion of reduced glutathione in surviving neurons in Parkinson's disease compared to nerve cell populations in control tissue. Mercury orange fluorescence indicated a high concentration of reduced glutathione in a subpopulation of non-neuronal cells, most likely astrocytes or microglia. Immunohistochemical examination of nigral tissue from the same Parkinson's disease and control patients with an antibody to glutathione showed staining in neuronal perikarya and axonodendritic processes of melanized nigral neurons which was generally most intense in control neurons. Moderately intense staining of the background neuropil, most prominent in control nigras, and staining of capillary walls was also detected. Intense staining was seen in cells with the morphological features of glial cells in both control and PD nigra. These data show a significant presence of reduced glutathione in the cell bodies and axons of nigral neurons. They are in agreement with biochemical studies showing depletion of reduced glutathione in substantia nigra in Parkinson's disease, and indicate a significant loss of neuronal reduced glutathione in surviving nigral neurons in Parkinson's disease.

