Effect of Low Dose Radiation on Antioxidant Levels in Rat Brain

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Background: Parkinson's disease (PD) is characterized by progressive degeneration of dopmaninergic neurons in the substantia nigra pars compacta. Although its etiology remains unknown, oxidative damage to the nigral dopaminergic neurons has been implicated in the pathogenesis of PD. An elevated level of antioxidants may be helpful in reducing the neuronal oxidative damage and thus reduce the progression of the disease. Our hypothesis is that low dose radiation promotes production of antioxidants in the brain, which could provide protection to the dopaminergic neurons, potentially leading to prevention or stabilization of PD. The purpose of the initial runs of this study is to determine the effect of low dose radiation on the total antioxidant capacity in normal rat brain, in order to optimize the dose settings for the subsequent parts of the study that utilize an experimental model of PD.

Methods: We have measured the total antioxidant capacity in cerebrum, cerebellum, and substantia nigra in rats (n=5 animals per group) 2-3 days after exposing their brains to low dose radiation in a Cs-137 irradiator. The rest of the body was shielded from the radiation. The radiation dose to the brain ranged from 0 cGy (sham radiation) to 45 cGy applied at the rate of 9 cGy/minute.

Results: Our preliminary data show that there is a marked increase in the measured total antioxidant capacity in all the examined sections of the brain as a result of 45 cGy dose to the brain. Further work on this project is in progress.

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