

Parkinson's Disease

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Reduced axonal transport in Parkinson's disease cybrid neurites is restored by light therapy.

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ABSTRACT: BACKGROUND: It has been hypothesized that reduced axonal transport contributes to the degeneration of neuronal processes in Parkinson's disease (PD). Mitochondria supply the adenosine triphosphate (ATP) needed to support axonal transport and contribute to many other cellular functions essential for the survival of neuronal cells. Furthermore, mitochondria in PD tissues are metabolically and functionally compromised. To address this hypothesis, we measured the velocity of mitochondrial movement in human transmitochondrial cybrid "cytoplasmic hybrid" neuronal cells bearing mitochondrial DNA from patients with sporadic PD and disease-free age-matched volunteer controls (CNT). The absorption of low level, near-infrared laser light by components of the mitochondrial electron transport chain (mtETC) enhances mitochondrial metabolism, stimulates oxidative phosphorylation and improves redox capacity. PD and CNT cybrid neuronal cells were exposed to near-infrared laser light to determine if the velocity of mitochondrial movement can be restored by low level light therapy (LLLT). Axonal transport of labeled mitochondria was documented by time lapse microscopy in dopaminergic PD and CNT cybrid neuronal cells before and after illumination with an 810 nm diode laser (50 mW/cm²) for 40 seconds. Oxygen utilization and assembly of mtETC complexes were also determined. **RESULTS:** The velocity of mitochondrial movement in PD cybrid neuronal cells (0.175 +/- 0.005 SEM) was significantly reduced ($p < 0.02$) compared to mitochondrial movement in disease free CNT cybrid neuronal cells (0.232 +/- 0.017 SEM). For two hours after LLLT, the average velocity of mitochondrial movement in PD cybrid neurites was significantly ($p < 0.003$) increased (to 0.224 +/- 0.02 SEM) and restored to levels comparable to CNT. Mitochondrial movement in CNT cybrid neurites was unaltered by LLLT (0.232 +/- 0.017 SEM). Assembly of complexes in the mtETC was reduced and oxygen utilization was altered in PD cybrid neuronal cells. PD cybrid neuronal cell lines with the most dysfunctional mtETC assembly and oxygen utilization profiles were least responsive to LLLT. **CONCLUSION:** The results from this study support our proposal that axonal transport is reduced in sporadic PD and that a single, brief treatment with near-infrared light can restore axonal transport to control levels. These results are the first demonstration that LLLT can increase axonal transport in model human dopaminergic neuronal cells and they suggest that LLLT could be developed as a novel treatment to improve neuronal function in patients with PD.

[Patol Fiziol Eksp Ter.](#) 2004 Jan-Mar;(1):15-8.

[Biochemical and immunological inducers of the blood in Parkinson's disease and their correction with the help of laser therapy]

[Article in Russian]

[Komel'kova LV](#), [Vitreshchak TV](#), [Zhirnova IG](#), [Poleshchuk VV](#), [Stvolinskii SL](#), [Mikhailov VV](#), [Gannushkina IV](#), [Piradov MA](#).

The influence of laser therapy on the course of Parkinson's disease (PD) was studied in 70 patients. This influence appeared adaptogenic both in the group with elevated and low MAO B and Cu/Zn SOD activity. Laser therapy resulted in reduction of neurological deficit, normalization of the activity of MAO B, Cu/Zn-SOD and immune indices. There was a correlation between humoral immunity and activity of the antioxidant enzymes (SOD, catalase). This justifies pathogenetically the use of laser therapy in PD.

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Laser modification of the blood in vitro and in vivo in patients with Parkinson's disease.

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The effect of He-Ne laser radiation on activity of MAO B, Cu/Zn-SOD, Mn-SOD, and catalase in blood cells from patients with Parkinson's disease was studied in vivo and in vitro. The effects of intravenous in vivo irradiation (intravenous laser therapy) were more pronounced than those observed in similar in vitro experiments. It is concluded that generalized effect of laser therapy involves interaction between blood cells.