

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

Vitreshchak TV<sup>1</sup>, Mikhailov VV, Piradov MA, Poleshchuk VV, Stvolinskii SL, Boldyrev AA.

Bull Exp Biol Med. 2003 May;135(5):430-2.

### **Abstract**

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.

## **Biochemical and immunological induces of the blood in Parkinson's disease and their correction with the help of laser therapy.**

Komel'kova LV, Vitreshchak TV, Zhirnova IG, Poleshchuk VV, Stvolinskii SL, Mikhaïlov VV, Gannushkina IV, Piradov MA.

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

### **Abstract**

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.

## **CNS Disorders – MS, Parkinson’s, Spinal Cord Injury**

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The greatest obstacle to healing damage to the central nervous system (brain and spinal cord) is overcoming autoimmune and other factors which inhibit nerve regeneration. If we can apply methods to accomplish this, the prospects for greater functional recovery from brain and spinal cord injuries, multiple sclerosis and Parkinson’s disease stand to improve significantly.

### **Spinal Cord Injury**

Spinal cord injuries can result in partial to complete paralysis and loss of sensation below the site of the trauma. Approximately 250,000 Americans have spinal cord injuries, and about 11,000 new cases occur annually. 52% are paraplegic and 47% quadriplegic. Care is mostly supportive and palliative – and very expensive. Average lifetime costs for the care of paraplegics are \$428,000 and \$1.35 million for quadriplegics. [1]

Whereas peripheral nerve injury may be relatively easy to heal, regeneration of neurons in the brain and spinal cord is more difficult, commonly hindered by autoimmune issues, secondary injury and lack of growth factors. For the last 30 years management of acute spinal cord injuries has usually included high dosages of steroid drugs with the rationale for treatment based more perhaps on the theory of their physiological effects than the reality. Outcomes have been disappointing. In a 2006 survey of spine surgeons, only 24% reported that they believed that methylprednisolone had clinical value in spinal cord injury, yet 90.5% reported continuing to administer this steroid treatment [2] Albert Einstein defined insanity as doing the same thing over and over again and expecting different results.

### **Light on Nerves**

A growing body of science suggests that energy-based treatments, particularly laser phototherapy, may improve recovery and quality of life in spinal cord injury and other CNS conditions. Low intensity lasers have been documented to protect nerves and preserve their function, increase axonal regrowth and myelination, diminish scar tissue at the site of the lesion and

may even reduce degeneration of associated motor neurons in the spinal cord.

Byrnes et al studied the effects of transcutaneous laser light in spinal cord injury in rats. 6% of light penetrated to the spinal cord, and treatment significantly increased the number of axons and the distance of nerve regrowth, suppressing immune cell activation and restoring some portions of function to their baseline levels. [3]

Laser phototherapy has proven to be useful to enhance the proliferation of stem cells and other cultured cells and is being studied as a key method to stimulate the regeneration not only of peripheral and CNS neurons but other cells and tissues. [4,5,6,7].

Perhaps the most compelling evidence of phototherapy's promise to raise the bar in the treatment of CNS disorders may come in its documented neuroprotective benefits:

- [Alcoholic Coma](#)
- [Dioxin Exposure](#)
- [Fluoride Exposure](#)
- [Hydrogen Peroxide](#)
- [Ischemic Injury](#)
- [Liposaccharide induced Endotoxemia](#)
- [Methanol Intoxication](#)
- [Nicotine Exposure](#)
- [Potassium Cyanide Exposure](#)
- [Rotenone- and MPP+- Exposure](#)
- [Rotenone- and 1-methyl-4-phenylpyridinium Exposure](#)
- [Snake Venom Exposure](#)

### **Multiple Sclerosis**

“Our results from the use of laser therapy on multiple sclerosis cases shows that laser biostimulation is a successful and effective method by which to treat patients,” said Dr. Cezary Peszynski-Drews, director of the Laser Diagnostics and Therapy Center of the Technical University of Łódź, Poland. He has been treating MS patients with this method since at least 2003 and also noted, “While it does not prevent multiple sclerosis, it makes patients

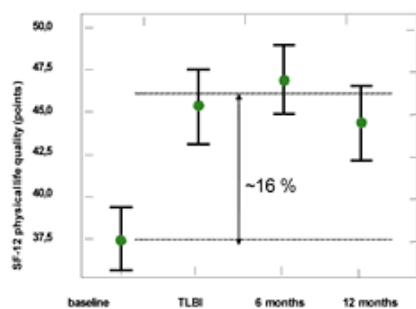
significantly stronger, even in the most advanced stages of the disease. After treatment patients are able to move around on their own, walk short distances, and make their own breakfast. They are not totally dependent on someone else to help them and this in itself is a personal success.” [Click here to view the full article in The Warsaw Voice.](#)

MS is an inflammatory disease in which myelin, a protective lining around axons in the brain and spinal cord, is attacked by the immune system. Over time injured nerves can degenerate to form the multiple sclerotic plaques which give the condition its name. Signs and symptoms are the result of degraded nerve transmission and may include pain, loss of sensation, spasticity, bladder or bowel dysfunction, and loss of vision. MS is highly individual, depending upon the location and degree of injury of nerves affected.

In a study at the University of Heidelberg, 42 subjects with MS received a series of 10 treatments with transcutaneous laser irradiation of the blood over 4 superficial veins within two weeks and a second series of three sessions over 3 weeks. Subjects reported a 16% improvement in physical quality of life and a 67% improvement in psychological quality of life. It is noteworthy that the improvements in both physical and psychological quality of life were long lasting, still well above baseline 12 months following the last treatment.

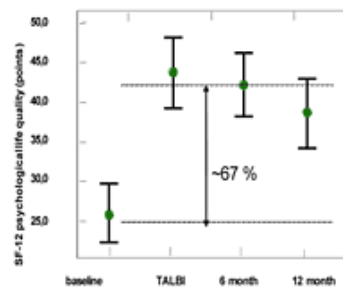
 SF 12 Questionnaire Physical Life Quality

physical life quality (sum-index) alterations  
37,4 +/- 5,8 to 43,4 +/- 8,1 p=0,001



SF 12 Questionnaire Psychological Life Quality

psychological life quality (sum-index) alterations  
28,6 +/- 6,8 to 43,6 +/- 9,7 p=0,001



D.Schöna, University of Jüdelberg, Faculty of Science

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## Multiple Sclerosis – Case Study

“Tim” was a 61 year old male diagnosed with relapsing, remitting MS 12 years earlier. His chief complaints were pain (neck, wrists, knees, ankles), numbness, tremors, weakness, poor coordination, fatigue, depression, weak appetite, memory loss, vertigo and sleep > 10 hours daily. It should be noted that had often only been eating a single daily meal – or just snacked as

opportunity allowed when his employer referred him to our clinic and offered to pay for a series of treatments. “Tim” was also taking **15 drugs**: avonex, synthroid, zestril, prozac, wellbutrin, ritalin, gabapentin, thorazine, klonopin, flexeril, sinequan, acyclovir, darvocet, iodine, phenergan. [4]

“Tim” was asked: 1) to begin taking breakfast, lunch and dinner, 2) have his Vitamin D level tested, and 3) have all his current medications reviewed by an objective medical doctor. He was treated with laser therapy, transcutaneous laser blood irradiation, LED therapy and acupuncture during 5 regular weekly office visits and also received 10 sessions of bio-electromagnetic therapy, near daily at the outset.

All pain scores improved progressively. Vitamin D level was found to be in the low normal range, and he began supplementing. Eight months after completing the treatment series paid for by his employer, “Tim” was asked to describe the results. “I am stronger, and pain is less,” he said. “The effects have lasted. The biggest difference is that I can feel things and hold onto them better with my hands. My energy and mood are better.”

It has been over four years now since “Tim” was treated, and he reports that his improvement, particularly in grip strength, has been sustained.

Standard practice in treating MS has been limited in large part to pharmaceutical drugs thought to slow its progression (beta interferons), treat symptoms or reduce inflammation during exacerbations (steroids). While these methods may be helpful, to this writer’s knowledge they have not reversed the condition. Energy-based treatments, including laser and LED phototherapy and bio-electromagnetic therapy, have been shown to stimulate nerve regeneration and function, even in CNS injury. They may reduce the demyelination, inflammation and neuropathies which are associated with multiple sclerosis. Implementing these energy-based therapies and studying their effects has the potential to raise the bar in health care and may significantly improve quality of life in MS.

### **Parkinson’s Disease**

Signs and symptoms of Parkinson’s disease are associated with damage to the substantia nigra, cells at the base of the brain which produce the neurotransmitter, dopamine. When Shaw et al administered near infrared light to dopaminergic cells from the substantia nigra, they found that it

protected them from the effects of MPTP, a substance which induces Parkinson-like symptoms. “In summary, our results indicate that NIR (near infrared) light treatment offers neuroprotection against MPTP toxicity for dopaminergic cells in the SNc (substantia nigra), but not in the ZI-Hyp (hypothalamus.” [Click here to view the full abstract.](#)

Breakdown and impaired function of mitochondria resulting in insufficient ATP production has also been implicated in the pathogenesis of Parkinson’s disease. Trimmer et al proposed that, as a result, axonal transport may be reduced in PD and also observed, “..that a single, brief treatment with near-infrared light can restore axonal transport to control levels. These results are the first demonstration that LLLT (low level laser therapy) 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.” [See the abstract in its entirety here.](#)

### **Parkinson’s Disease – Case Study**

“Sylvia” was a 74 year old female who had been diagnosed with Parkinson’s disease 4 year’s earlier, also diabetic and on blood pressure medication. Her complaints were muscle weakness, poor coordination, low energy, back pain, depression and stress. She was treated with near daily bio-electromagnetic therapy x 35 days and weekly acupuncture and laser therapy.

“Sylvia” reported significant improvements in energy, muscular control and mood right away. “Sylvia” has a system in home for daily self-treatment. Blood pressures and sugars, color and demeanor also improved. Her gait became steady and rapid. Time to go from a sitting in the lobby to supine position in the treatment room was reduced from 40 to 21 seconds.

### **Laser Therapy Research**

- [Alzheimer’s Disease](#)
- [Amyotrophic Lateral Sclerosis](#)
- [Brain Effects](#)
- [Brain Injury](#)
- [Central Nervous System Disorders](#)
- [Cerebral Effects](#)
- [Cerebral Palsy](#)
- [Multiple Sclerosis](#)

- Nerve
- Nerve Regeneration in Children
- Nerve Regeneration – Protection
- Neuropathy
- Neurotoxicity Protection
- Parkinson's Disease
- Peripheral Nerve Regeneration
- Stroke

### **Pulsed Electromagnetic Field Therapy Research**

- Alzheimer's Disease
- Amyotrophic Lateral Sclerosis
- Cognitive – Memory – Emotional – Psychological Disorders
- Multiple Sclerosis
- Nerve Regeneration
- Neurological
- Neuronal Effects
- Neuropathy – Neuropathic Pain
- Optic Nerve Atrophy
- Parkinson's Disease
- Spinal Cord Injury
- Stroke

[1] Spinal Cord Injury Facts & Statistics <http://www.sci-info-pages.com/facts.html>

[2] Eck JC, Nachtigall D, Humphreys SC, Hodges SD. Questionnaire survey of spine surgeons on the use of methylprednisolone for acute spinal cord injury. *Spine*. Apr 20 2006;31(9):E250-3.

[3] Byrnes KR, Waynant RW, Ilev IK, Wu X, Barna L, Smith K, Heckert R, Gerst H, Anders JJ. *Light promotes regeneration and functional recovery and alters the immune response after spinal cord injury*. *Lasers Surg Med*. 2005 Mar;36(3):171-85.

[4] Alghamdi KM, Kumar A, Moussa NA *Low-level laser therapy: a useful technique for enhancing the proliferation of various cultured cells*. *Lasers Med Sci*. 2011 Jan 28. [Epub ahead of print]

[5] Tuby H, Maltz L, Oron U, *Implantation of low-level laser irradiated mesenchymal stem cells into the infarcted rat heart is associated with*

*reduction in infarct size and enhanced angiogenesis*. Photomed Laser Surg 2009 Apr;27(2):227-33.

[6] Eduardo Fde P, Bueno DF, de Freitas PM, Marques MM, Passos-Bueno MR, Eduardo Cde P, Zatz M. *Stem cell proliferation under low intensity laser irradiation: a preliminary study*. Lasers Surg Med. 2008 Aug;40(6):433-8.

[7] Shefer G, Ben-Dov N, Halevy O, Oron U. *Primary myogenic cells see the light: improved survival of transplanted myogenic cells following low energy laser irradiation*. Lasers Surg Med. 2008 Jan;40(1):38-45.

[8] June 17, 2010, Laser Treatment for Multiple Sclerosis, The Warsaw Voice <http://www.warsawvoice.pl/WVpage/pages/article.php/22147/article>

[9] Physical and psychological benefits to quality of life reported following transcutaneous blood irradiation in MS courtesy of Dr. Detlef Schikora, University of Paderborn, Faculty of Science, Germany.

[10] Polypharmacy is “the act or practice of prescribing too many medications.” Websters Revised Unabridged Dictionary.

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<http://cooperativemedicine.com/laser-articles/neurological-multiple-sclerosis-parkinsons-disease/>

## **Reduced axonal transport in Parkinson’s disease cybrid neurites is restored by light therapy.**

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Mol Neurodegener. 2009 Jun 17;4:26.

**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/cm<sup>2</sup>) 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.

### **Neuroprotection of midbrain dopaminergic cells in MPTP-treated mice after near-infrared light treatment.**

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J Comp Neurol. 2010 Jan 1;518(1):25-40.

## Abstract

This study explores whether near-infrared (Nlr) light treatment neuroprotects dopaminergic cells in the substantia nigra pars compacta (SNc) and the zona incerta-hypothalamus (ZI-Hyp) from degeneration in 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP)-treated mice. BALB/c albino mice were divided into four groups: 1) Saline, 2) Saline-Nlr, 3) MPTP, 4) MPTP-Nlr. The injections were intraperitoneal and they were followed immediately by Nlr light treatment (or not). Two doses of MPTP, mild (50 mg/kg) and strong (100 mg/kg), were used. Mice were perfused transcardially with aldehyde fixative 6 days after their MPTP treatment. Brains were processed for tyrosine hydroxylase (TH) immunohistochemistry. The number of TH(+) cells was estimated using the optical fractionator method. Our major finding was that in the SNc there were significantly more dopaminergic cells in the MPTP-Nlr compared to the MPTP group (35%-45%). By contrast, in the ZI-Hyp there was no significant difference in the numbers of cells in these two groups. In addition, our results indicated that survival in the two regions after MPTP insult was dose-dependent. In the stronger MPTP regime, the magnitude of loss was similar in the two regions (approximately 60%), while in the milder regime cell loss was greater in the SNc (45%) than ZI-Hyp (approximately 30%). In summary, our results indicate that Nlr light treatment offers neuroprotection against MPTP toxicity for dopaminergic cells in the SNc, but not in the ZI-Hyp.