Systemic (Intravenous) Laser Therapy with the Weberneedle® Endolaser Technology

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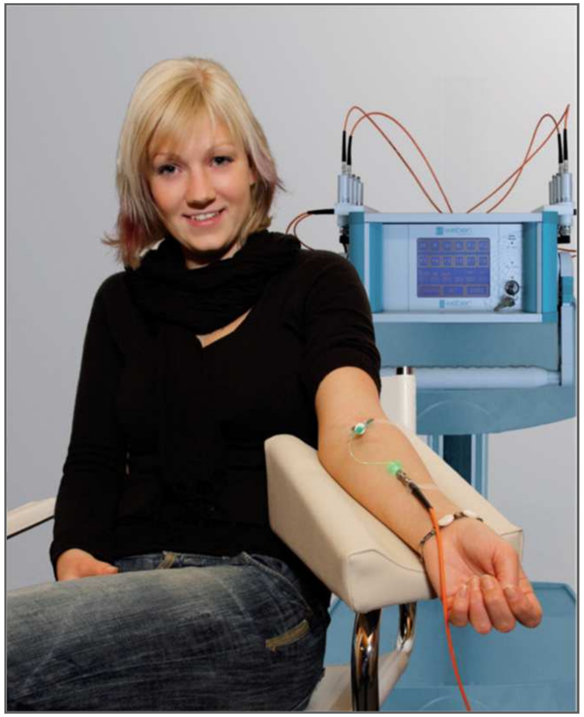
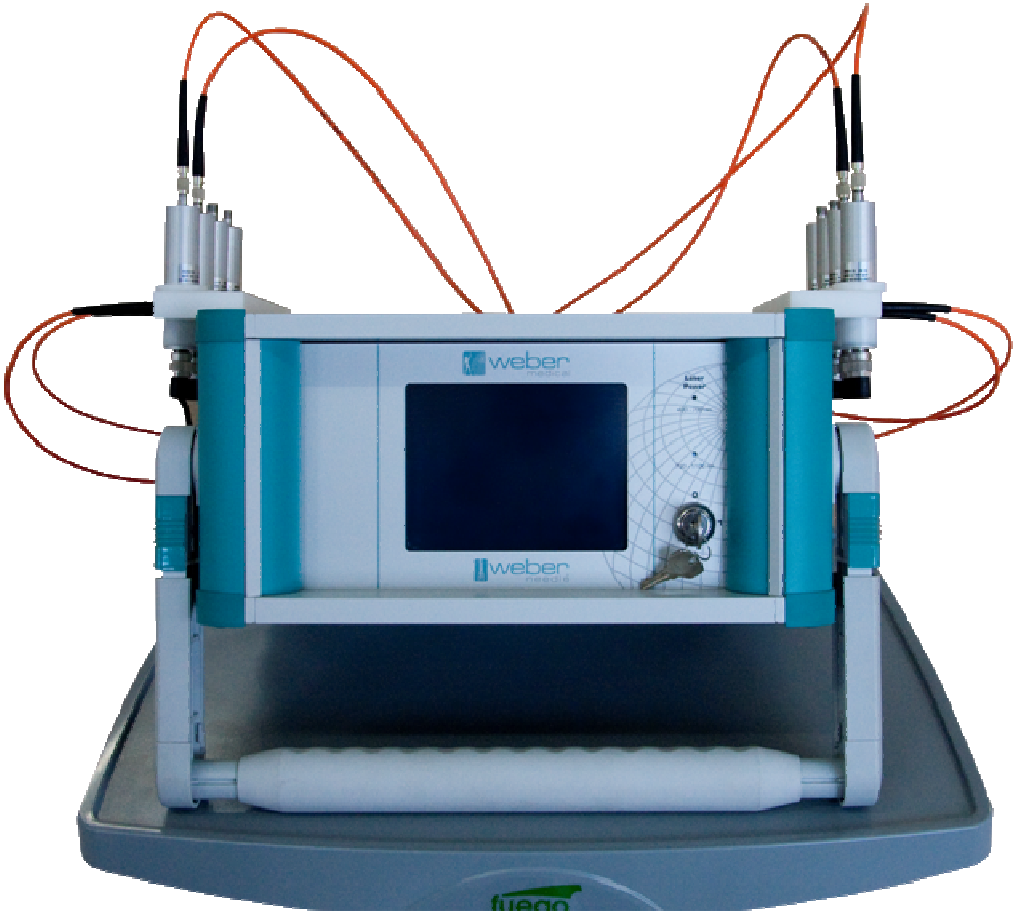


Weberneedle® Endolaser with Red, Green, Blue, Yellow and Ultraviolet Light

HIGH QUALITY
MADE IN GERMANY



International Medical Approvals:

- CE Approval (Europe)
- Health Canada
- US-FDA for External Laser Therapy (IV application = off-label use)
- TGA Australia for External Laser Therapy
- Taiwan-FDA

Development with Support of German Government and European Union

Important Studies with the Weberneedle® Endolaser (1):

- Andrae, F. (2007): The Effects of intravascular Low Level Laser Therapy in the Scope of a Redifferentiation Therapy of Malignant Tumors
- Raggi, F./ Vallesi G. (2008): Intravenous Laser Blood Irradiation in Sports Medicine
- Litscher G./ Chiran/ Weber/ Ailioaie L./ Ailioaie C./Litscher D. (2013): Intravenous Laser Blood Irradiation Increases Efficacy of Etanercept in Selected Subtypes of Juvenile Idiopathic Arthritis - An Innovative Clinical Approach
- Weber et al. (2010): Intravenous Laser Blood Irradiation: Introduction of a New Therapy
- Aluani, P. (2007): Intravenous Laser Therapy: Case Reports from the Field
- Schulte-Uebbing, C. (2014): Intravenous Laser Therapy as an Integrative Approach in Immunology
- Schulte-Uebbing, C. (2015): Intravenous Laser Therapy in an Integrative Therapy Concept for Treatment of Auto-immune Diseases (Hashimoto‘s Disease)

Important Studies with the Weberneedle® Endolaser (2):

- Schumm, N. (2006): Intravenous Laser Therapy: A Pilot Study for Treatment of Multiple Sclerosis
- Schumm, N. (2008): Intravenous Laser Blood Irradiation in Multiple Sclerosis: A New Therapeutic Procedure with Significant Improvement in Quality of Life
- Wirz, A. (2008): Frequencies With Consequences. Pilot Study for Treating Diabetes
- Noohi/ Javdani/ Kiavar (2008): Study of the Efficacy of Low Level Laser in Myocardial Perfusion in Patients with Chronic Stable Angina
- Wieden, T. (2009): Fibromyalgia in Pain Therapy. Mechanisms and Treatment Opportunities in Laser Therapy
- Wirz/ Baumgartner/ Burger/ Gerber (2008): Intravenous Laser Therapy in the Treatment of Horses. Results of a Multi-Center Pilot Study
- Zuern, I. (2016): Pilot Study on Treatment of Chronic Lyme Disease with Yellow and Blue Laser
- Ailioaie et. al (2011): Laser Regeneration of Nerve Injuries in Children

Scientific Partnerships:

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

ISLA RESEARCH GROUP
International Society for Medical Laser Applications

Philipps Universität Marburg

NAALT
North American Association for PhotobiomoduLation Therapy

Medizinische Universität Graz

UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

MAYO CLINIC

ISLA
International Society for Medical Laser Applications

UNIVERSITY OF MEDICAL SCIENCES
ONDO STATE, NIGERIA

FACULTY OF MEDICINE
KHON KAEN UNIVERSITY
1972

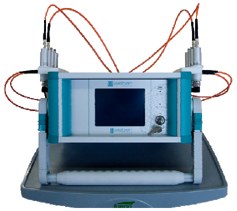
Ongoing Research Projects:

- University Marburg: Photodynamic Cancer Therapy
- Laser Research Center Dr. Michael Weber: Photodynamic and Sonodynamic Cancer Therapy
- University Ondo (Nigeria): Anti-microbial Photodynamic Therapy for Malaria (p. falciparum)
- Prof. L. Ailioaie (Romania): Intravenous Laser for Infections and Cancer
- Prof. L. Ailioaie (Romania): Intravenous Laser for Anti-Aging
- Dr. M. Grandjean (Frankfurt): Intravenous Laser for Treatment of Silent Inflammation
- University Modena (Italy): Effects of Intravenous Laser on Oxygenation Potential, Autoimmune Reactions, Number and Functions of Platelets and on Diabetes and Kidney Diseases

Weber Medical:

- Products Made in Germany
- Focus on evidence-based medicine → cooperation with several research institutions
- Established in 2003 after many years of research and development in the field of medical lasers
- Received financial aid from the German government and the European Union in 2004 for the development of the world's first multichannel laser systems for invasive laser therapy
- CE approval since 2005 → 12 years of clinical experience with data from more than 1500 clinics worldwide
- Weber Medical has quickly become one of the world's leading companies in medical laser technology
- Weber Medical operates treatment and training centers in Germany and Thailand
- With the aim of building a worldwide distribution, research and education network the company founded the International Society for Medical Laser Applications (ISLA e.V.) in 2006
- Weber Medical is undertaking constant research and development in cooperation with different universities worldwide to ensure high standards and a continuous development of the products

Technical Information and Comparison to Other Devices:



- The Weberneedle® laser devices are ***modular systems*** that can be equipped with up to ***12 lasers with different wavelengths/ colors***
- FDA, CE, Health Canada and other internatiol approvals
- Disposables such as needles and catheters available at a reasonable price
- Using real lasers instead of cheap LED technology (coherent light with high specificity to various cellular components and deeper penetration in blood and tissue)
- All available wavelengths/ colors (infrared, red, green, blue, yellow, ultraviolet) available
- Weberneedle® devices can also be used for external (superficial), interstitial and intra-articular applications (regenerative therapies for pain, osteoarthritis, chronic spine syndromes etc.) as well as for photodynamic cancer therapy
- Weberneedle® technology offers different needles: IV needles for intravenous application, interstitial needles with different lenghts (4-12cm) for interstitial and intra-articular applications and 3-way needles for simultaneous infusion and IV laser therapy

The Inventor: Michael Weber, MD

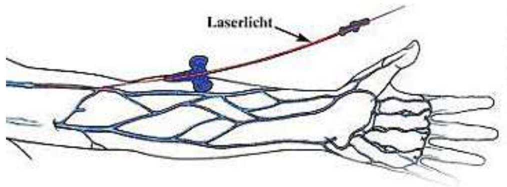
- Dr. Michael Weber is a medical practitioner for more than 30 years in Germany and leader of three medical centers for general and internal medicine, pain management and cancer treatment
- Besides his MD diploma he's also a certified bio-chemist who is working in research with many national and international institutions and universities
- He is president of the International Society for Medical Laser Applications, editor in chief of the International Journal for Medical Laser Applications and co-editor of several other medical journals
- He is also developer of the patented Weberneedle® medical laser devices which were financially supported by the German government and the European Union

History of Systemic Light Therapy:

1. UV Light Therapy (UVBI):

- In 1903 a Nobel Price was awarded for the observation that cutaneous TB can be cured by UV light. The practice of UV light therapy began in the 1920s when a UV therapy device was developed for extracorporeal treatment of the blood by Emmet Knott
- The technique was called Ultraviolet Blood Irradiation (UVBI), Hematogenous Oxygenation Therapy (HOT) or Extracorporeal Photophoresis
- At that time, the therapy was conducted extracorporally (withdrawal of 60 cc's of blood, brief irradiation with UV light and return into patient's bloodstream)
- It was used in the 1930's to 1950's to combat polio virus and other medical conditions including pneumonia, tuberculosis and cancer
- The advent of antibiotics led to a decline in the use of UVBI as a treatment option
- Nowadays, with an increasing incidence of antibiotic resistant infections and a desire for more natural therapies, UV light therapy is enjoying rising popularity again
- Today UV light is also used to sterilize surgical instruments to eliminate MRSA etc. and in transfusion medicine for sterilizing blood probes from bacteria and viruses

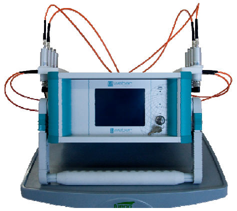
History of Systemic Light Therapy:



2. Systemic Laser Therapy in Russia:

- The method of intravenous laser blood irradiation was first introduced into therapy by the Soviet scientists E.N.Meschalkin and V.S.Sergiewski in 1981 [37] for the treatment of cardiovascular diseases
- A red light laser (632nm) with a power of 1-3 mW was used for 20-60 min
- Improvement of rheologic properties of the blood as well as improvement of microcirculation and reduction of the area of infarction had been proved. Further reductions of dysrhythmia and sudden cardiac death occurred [5,24]
- In the years after, many (for the most part Russian) studies showed various effects on many organs and on the hematologic and immunologic system
- Besides clinical research and application for patients, the cell biological basis was developed by the Estonian cell biologist Tiina Karu at the same time. A summary can be found in her work “The Science of Low-Power Laser-Therapy” [21]

History of Systemic Light Therapy:



3. Developments in Germany:

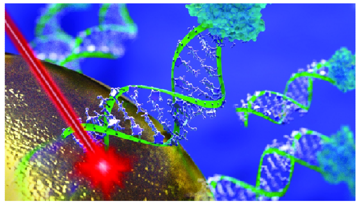
- First machine with red laser 635nm according to Russian technology was approved in Europe in 2005

- First case studies on patients confirmed Russian data

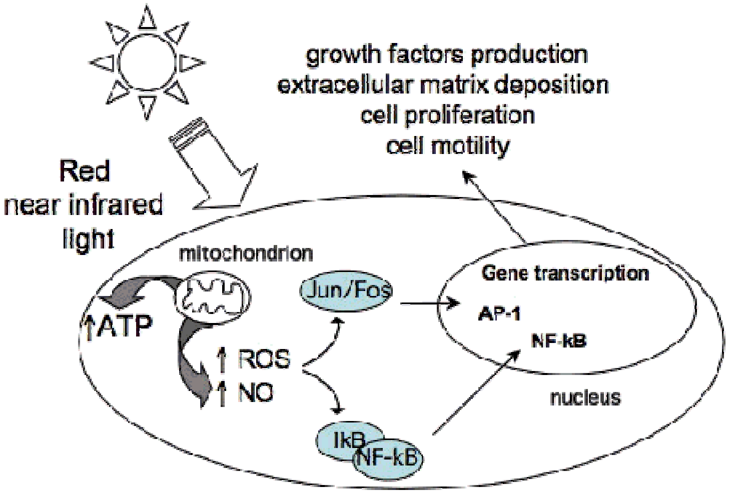
- Distribution of technology started with simulatenous collection of data and studies from different clinics

- In 2007 first green diode was developed
- In 2008 first blue diode was developed
- In 2013 first yellow diode was developed
- In 2016 first ultraviolet diode was developed

Biochemical Mechanisms:

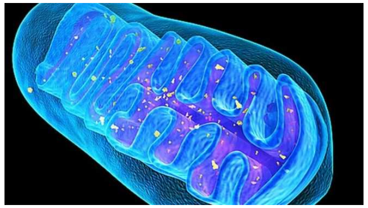


- In general, there are specific cellular structures that are able to absorb specific wavelengths (colors) of light (known as photoreceptors)
- The light stimulus gives a cellular signal affecting the chemical behavior, metabolism, movement and gene expression
- All associated enzymes and/or proteins are now affected
- This cascade event can ripple across an entire cell

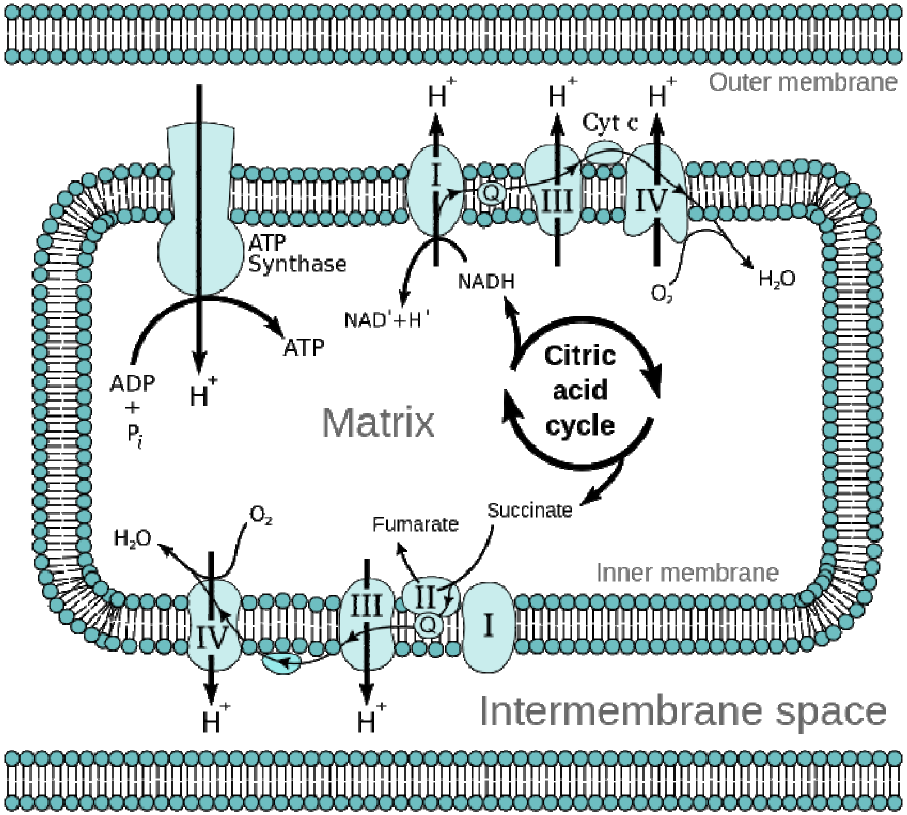


Hamblin:
http://photobiology.info/Hamblin.html

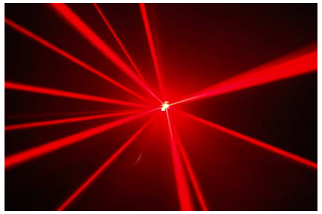
Absorption of Difference Light Wavelengths (Colors) in Mitochondria



- One example for the absorption of different colors within cells is the process in the mitochondrial respiratory chain [21]
- Complex 1 (NADH dehydrogenase) absorbs blue and ultraviolet light
- Complex 3 (cytochrome c reductase) absorbs green and yellow light
- Complex 4 (cytochrome c oxidase) absorbs red and infrared light



Effects of Red laser:



- Positive influence on rheological properties of the blood (58)
- Diminishing tendency of aggregation of thrombocytes and improved deformability of erythrocytes [10, 29]
- Activation of phagocytic activity of macrophages [9, 26]
- Positive effect on the proliferation of lymphocytes and B-and T-cell subpopulations [13, 58]
- Stimulation of immune response with increase of the immunoglobulines IgG, IgM and IgA [43]
- Stimulation of interferons, interleukins and TNF-alpha [48, 50, 51, 68]
- Hypoxia of the tissue is improved and fibrinolysis is activated [62]
- Development of so-called “giant mitochondria” with activation of various metabolic pathways, increased production of ATP and normalization of cell membrane potential [36, 55]
- Analgetic, spasmolytic and sedative effects [62, 63]
- Improves microcirculation in central nervous structures with stimulation of the functional activity of the hypothalamus and limbic system, leading to an activation of hormonal, metabolic, immunological and vegetative processes with mobilization of adaptive reserves [11]

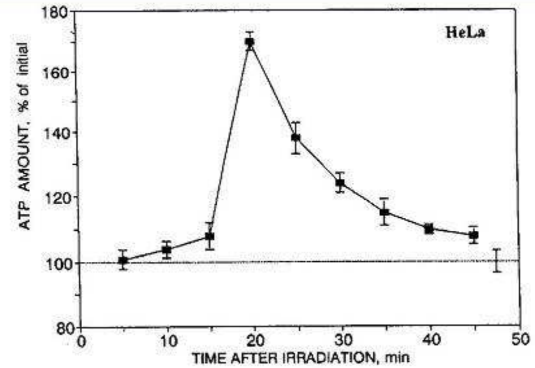
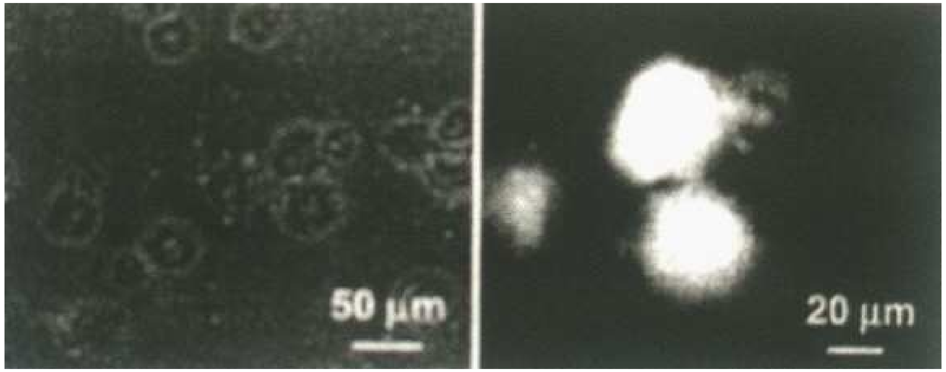
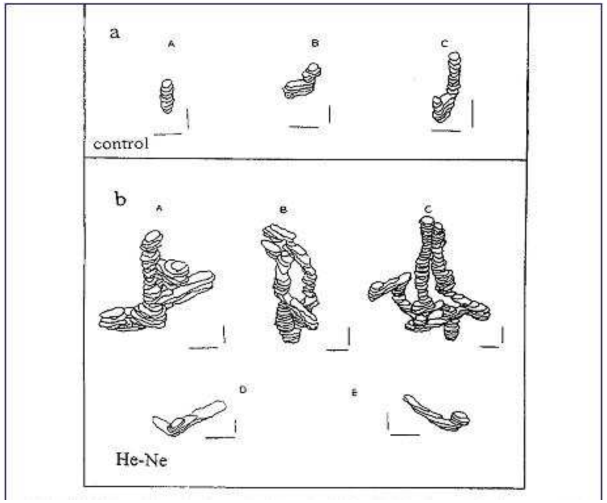


Figure 7.9 ATP level in exponental-phase HeLa cells (72h post-plating) as a function of the time elapsed after irradiation (632.8 nm, 100 J/m², 10 s) (Karu *et al.*, 1995).

ATP-Increase under laser irradiation (632 nm, red light) of a HeLa cell-culture



Activation of macrophages



'Giant' mitochondria in human lymphocytes after laser irradiation (632 nm)

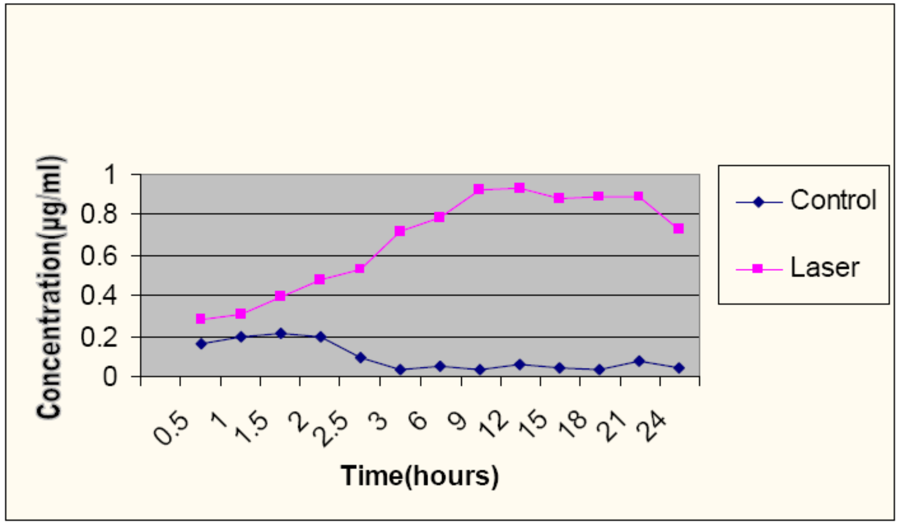
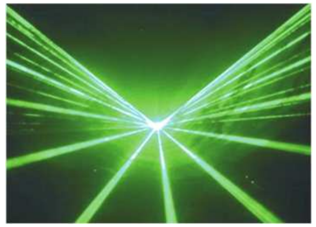
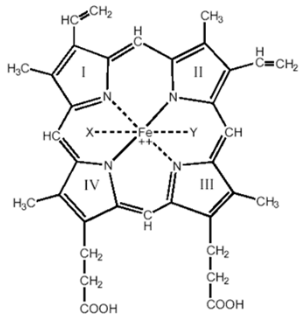


Figure (1) Concentration / Time relationship of IgM of both groups

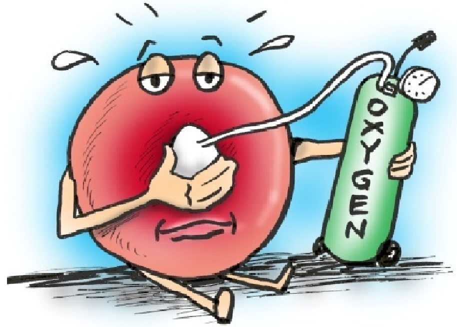
Effects on the immune system

Effects of Green Laser:

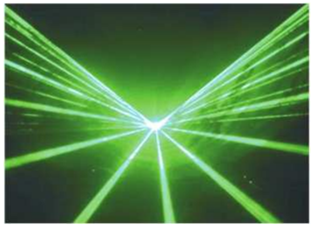




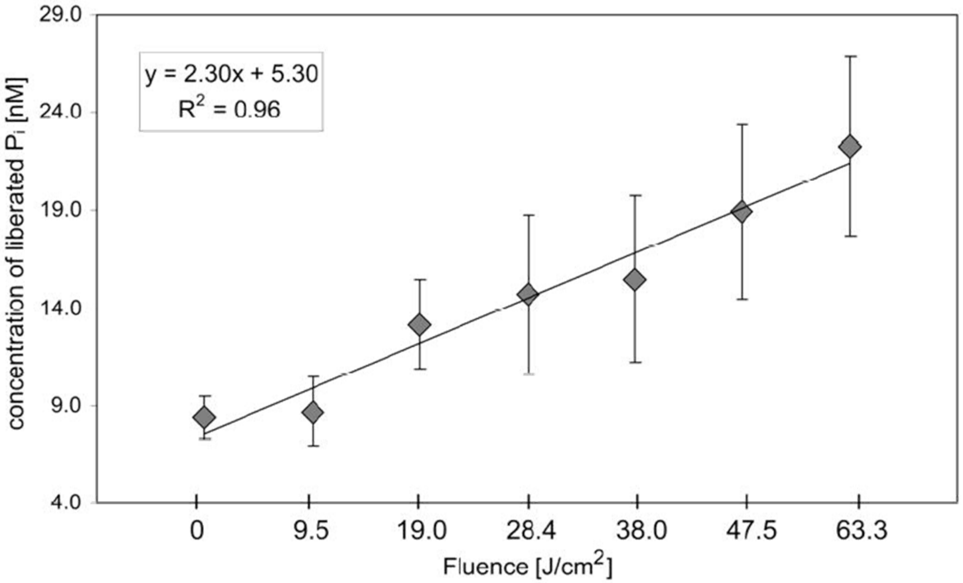
- Green binds to hemoglobin
- Improves the function, behavior and cell elasticity of red blood cells [17, 20, 38, 61]
- Increases Oxygen Delivery [17, 20, 31, 38, 50]
  - improved oxygen affinity
  - increased attraction of oxygen to hemoglobin
  - Improved ability to carry more oxygen
- Decreases in lactic acid [17, 20]
- Reduces blood viscosity and improves blood flow [31, 38, 50]
- Activates reparative and stabilizing pathways [20, 38, 50]
- Platelet activation with gradual loss of natural platelet reactivity and ability to respond to activating agents [17, 20]
- Positive effect on Sodium/Potassium Pump, which helps to regulate intra-and extra-cellular cation homeostasis [23]



Effects of Green Laser:

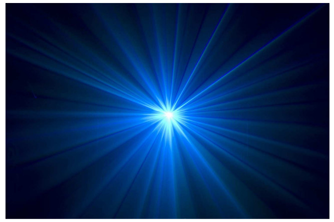


- Kassak et al. (2005): Green laserlight increases the production of ATP in the irradiated mitochondria for more than 30% [23]

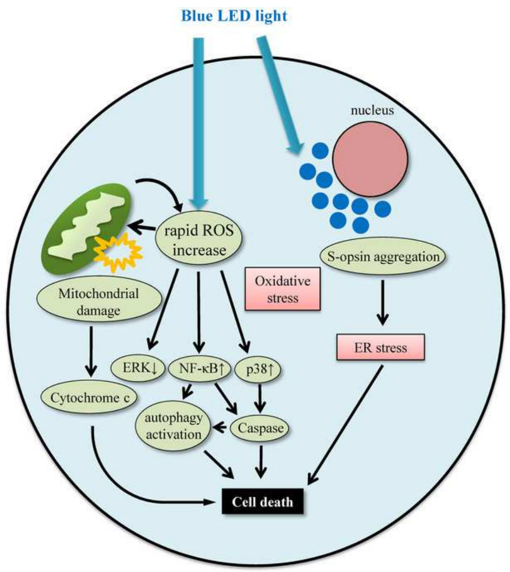


Activity of Na+/K+-ATPase of red blood cells irradiated with Nd:YAG laser of various fluences. Results are presented as mean ± S.E.M. of the concentration of inorganic phosphate (n=8). Equation of the trend line and coefficient of determination (R2) are shown.

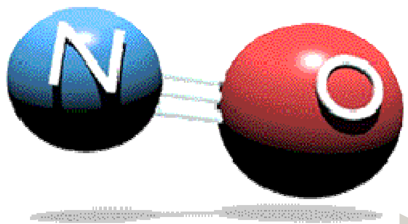
Effects of Blue Laser:

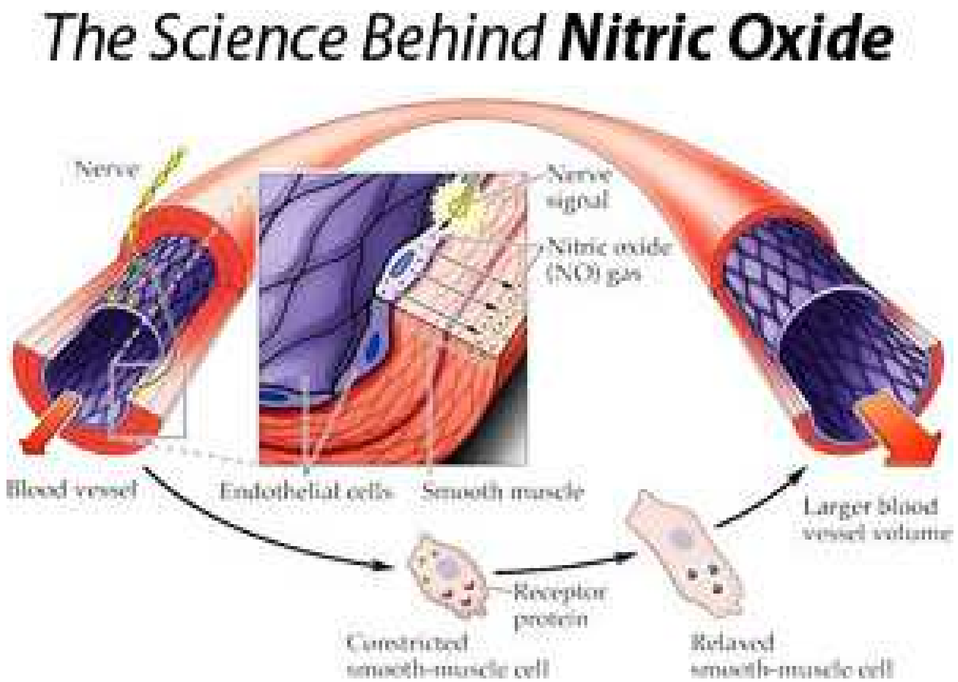


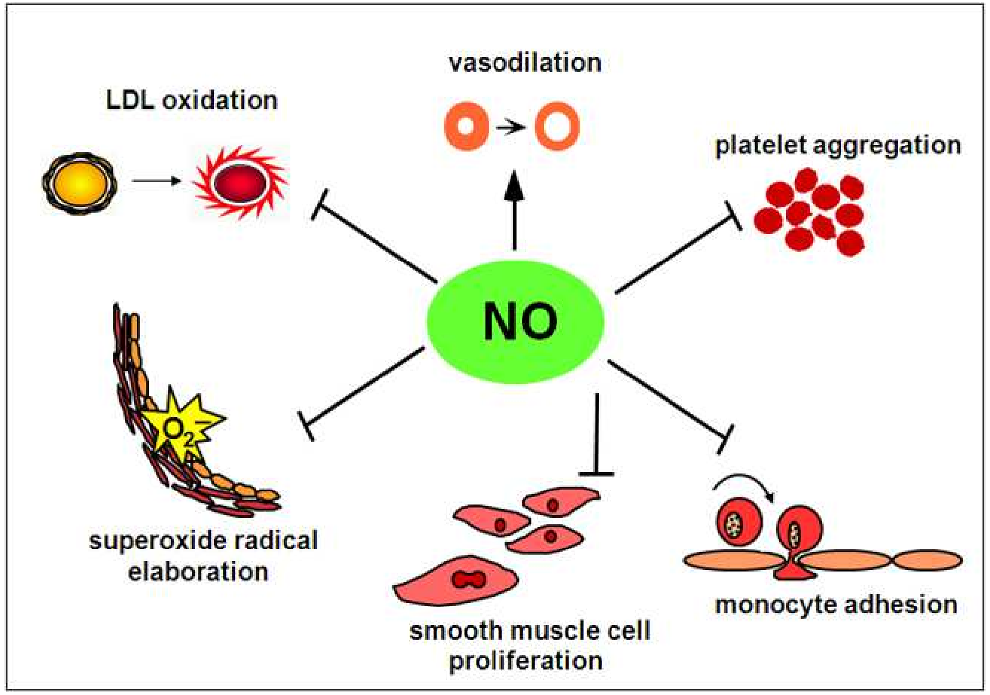
- Blue light **releases nitric oxide (NO) in monocytes with vasodilatation and improvement of endothelial dysfunction** [42]
- NO is known to be a growth, immune, and neuromodulator, as well as a stimulator of stem cell proliferation and it has a critical roles in analgesia, vasodilation and angiogenesis through c-GMP pathway
- Increased production of NO is activating the telomerase and thus stopping shortening of telomeres → anti-aging [60]
- Increased NO is lowering blood pressure [42]
- Blue laser is known to act anti-inflammatory by reducing pro-inflammatory cytokines and contributory factors for a variety of conditions (NF-kB, CRP, IL2, IL6, TNF alpha, Leptin, chemokines etc.) [51]
- Blue light is effective for treating infections by production of ROS (especially in combination with photosensitive substances like Curcumin or Riboflavin) [14]



Nitric Oxide Mechanism Of Actions:

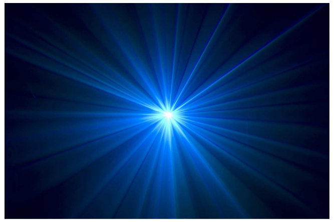







Nitric Oxide
Increases energy production
Increases blood flow to vital organs
Boosts exercise perform-ance & endurance
Manages diabetes by regulating insulin
Prevents diabetic complica-tions
Lowers blood pressure & LDL (bad) cholesterol
Reverses atheroscler otic plaque formation
Reverses kidney disease/ failure
Improves sexual perform-ance
Offsets damage from tobacco use
Enhances memory & cognitive function
Anti-ageing effects

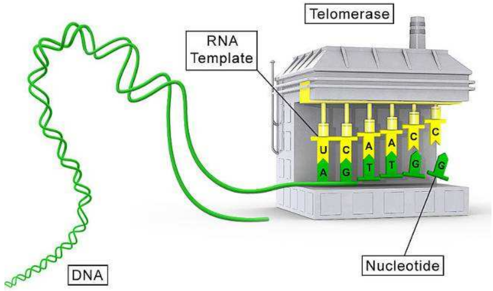
Anti-Aging Effects of Blue Light:

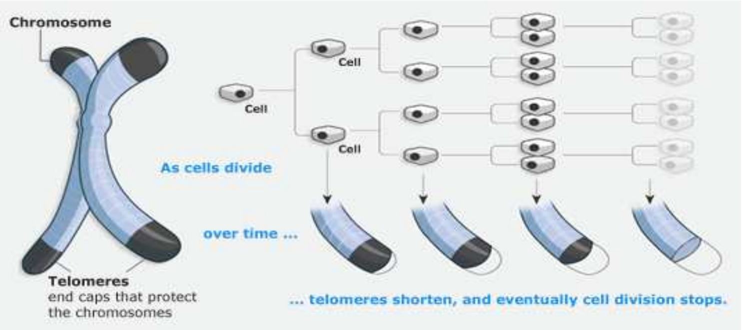


Nitric Oxide Activates Telomerase and Delays Endothelial Cell Senescence

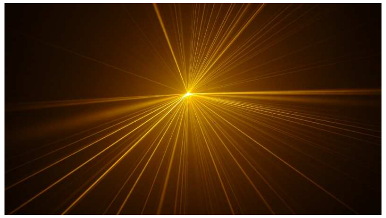
Mariuca Vasa, Kristin Breitschopf, Andreas M. Zeiher, Stefanie Dimmeler

The repeated addition of the NO donor S-nitroso-penicillamine significantly reduced EC senescence and delayed age-dependent inhibition of telomerase activity, whereas inhibition of endogenous NO synthesis had an adverse effect. Taken together, our results demonstrate that telomerase inactivation precedes EC aging. NO prevents age-related downregulation of telomerase activity and delays EC senescence.



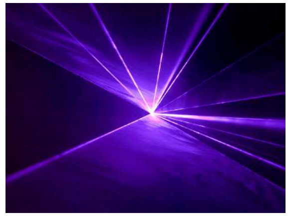


Effects of Yellow Light:



- Improvement of the anti-oxidant enzymatic system with detoxifying effect [50, 51]
- Strong anti-depressive effects (especially in combination with Hypericin from St. Johns Wort Plant) and positive influence on the general mood
- Positive effects on pain relief in chronic pain patients
- Improves Serotonin and Vitamin-D production [50, 51]
- Positive effects on the hormone system [50, 51]

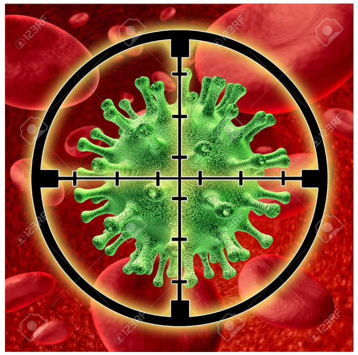
Effects of UV Light:

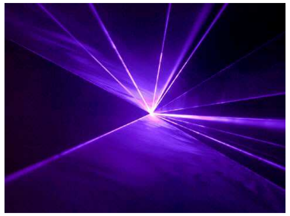


Experience has shown that ultraviolet blood irradiation can strengthen the immune system and improve overall health [39, 40, 41, 46, 47, 49].

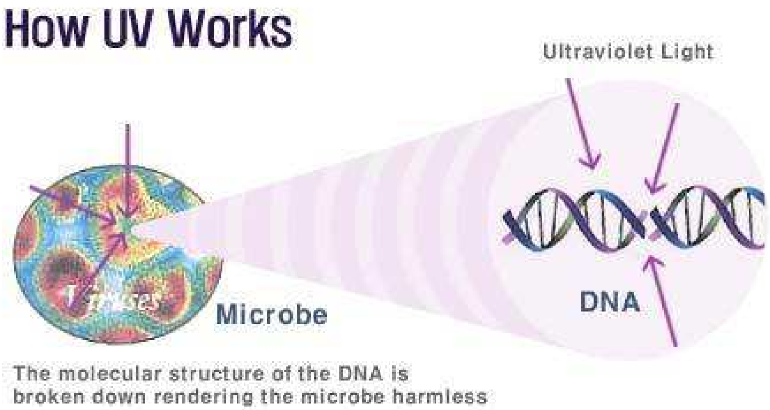
Ultraviolet blood irradiation has been shown to have the following therapeutic benefits:

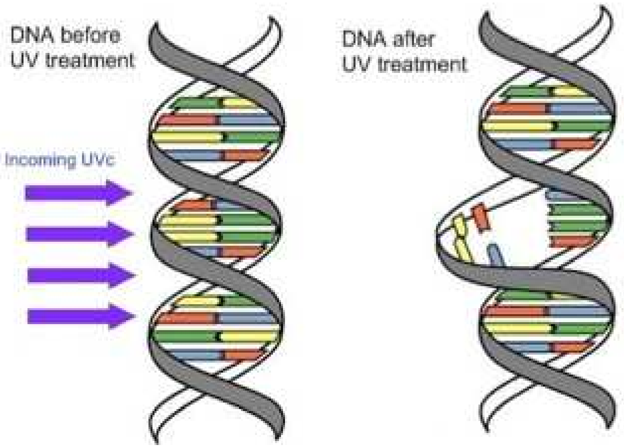
- Increases oxygen absorption into body tissues
- Destroys fungal, viral, and bacterial growth
- Improves circulation and decreases platelet aggregation
- Improves circulation by dilating blood vessels
- Improves the body's ability to detoxify and inactivate or remove toxins
- Activates cortisone-like molecules, sterols, into vitamin D
- Restores normal size and movement of fat elements





Pathogen Deactivation by UV Light:





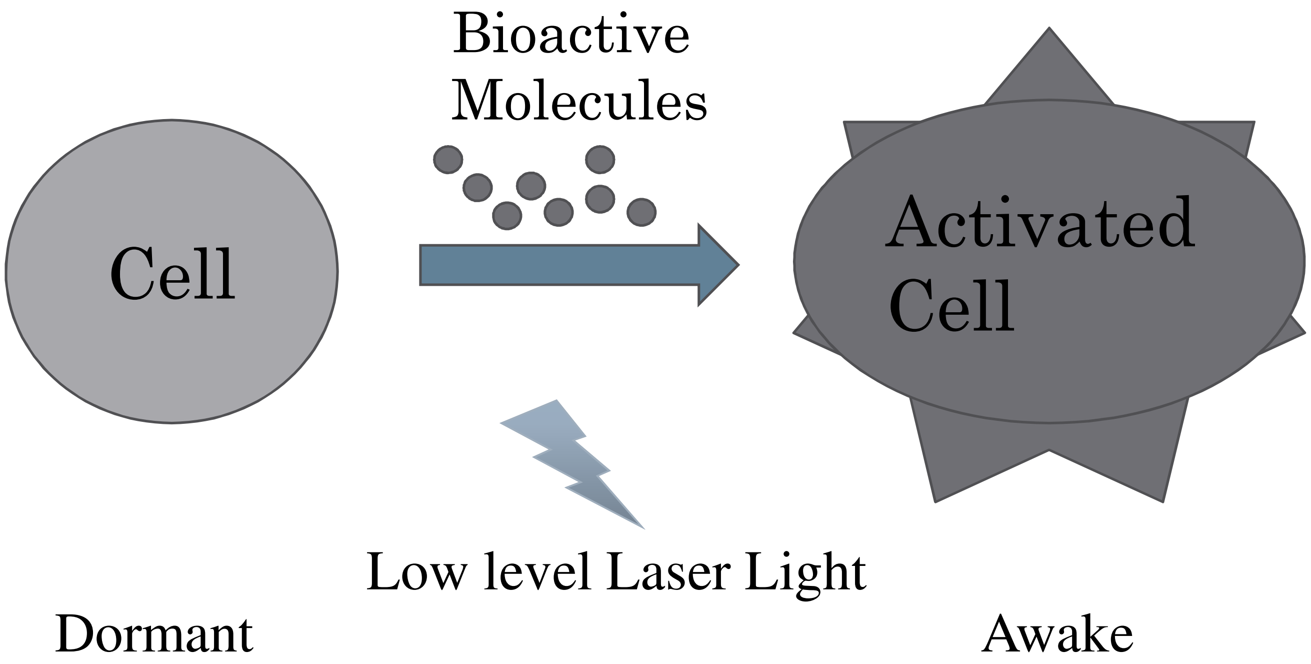
- Pathogens have a higher susceptibility to UV irradiation [39, 40, 41, 46, 47, 49]
- The antimicrobial effects of UV light result from increased production of toxix reactive oxygen species (ROS) and delayed pathogen replication
- UV light exposure primarily promotes sub-lethal effects, which stops replication and increases the pathogens susceptibility to immune degradation
- Pathogen damage also permits the release of antigens in which the immune system can build highly-specific antibodies to the pathogen strain
- Cell DNA sequence is interrupted and pathogen ability to bind is inhibited

Summary: Main Effects of IV Laser Therapy

- Boosting cellular energy by increase of ATP synthesis
- Immune System Stimulation
- Improvement of microcirculaton and reduction of blood viscosity
- Activation of macrophages
- Positive effects on heart and metabolism
- Improves the function, behavior and cell elasticity of red blood cells
- Increases Oxygen Delivery
- Activates reparative and stabilizing pathways
- Releases Nitric oxide (NO) and activates telomerase
- Brings down blood pressure
- Reduces inflammations
- Pathogen deactivation (effective against bacteria and viruses)
- Detoxifying effects
- Positive influence on the general mood (strong anti-depressive effects)
- Improves Serotonin and Vitamin-D production
- Pain relief
- Positive effects on the hormone system
- Activation of stem cells

PHOTO ACTIVATION of Stem Cells with Laser

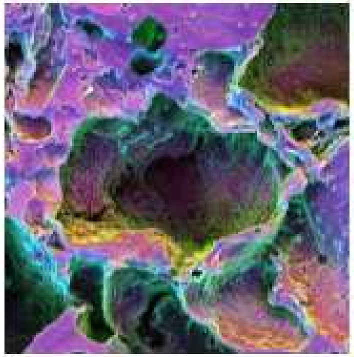
Laser irradiation can positively affect human stem cells by increasing cellular viability, proliferation, and expression of beta1-integrin [28, 48, 65].



light activates cells

PHOTO ACTIVATION of Stem Cells with Laser

Laser Activated Stem Cells Regenerate Tissue – Harvard
(http://lasermedcenters.com/laser-activated-stem-cells-regenerate-tissue-harvard/):



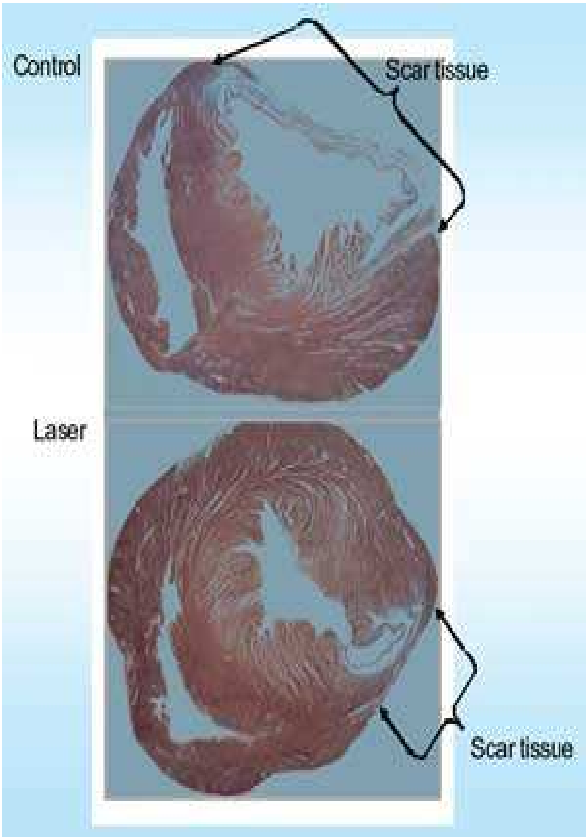
Praveen Arany et al./Harvard School of Engineering and Applied Sciences
Image of stem cells generated by laser

Harvard's groundbreaking new research in the use of lasers to stimulate stem cells to regrow tissue is generating interest and excitement throughout the medical community.
A recent study led by Harvard University's Wyss Institute has done more than just demonstrate that lasers can activate the process that causes stem cells to differentiate and promote tissue regeneration; they have proven the molecular mechanism by which the tissue can be grown.

PHOTO ACTIVATION of Stem Cells with Laser

Induction of autologous mesenchymal stem cells in the bone marrow by low-level laser therapy has profound beneficial effects on the infarcted rat heart.
Authors: Tuby H, Maltz L, Oron U.
Citation: Lasers Surg Med. 2011 Jul;43(5):401-9.
doi: 10.1002/lsm.21063.

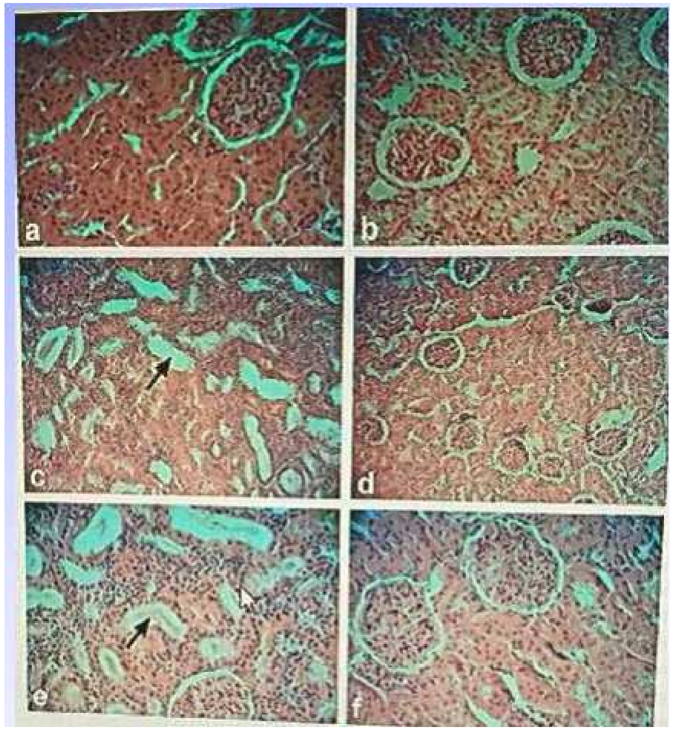
RESULTS:
Infarct size and ventricular dilatation were significantly reduced (76% and 75%, respectively) in the laser-treated rats 20 minutes post-MI as compared to the control-non-treated rats at 3 weeks post-MI. There was also a significant 25-fold increase in cell density of c-kit+ cells in the infarcted area of the laser-treated rats (20 minutes post-MI) as compared to the non-laser-treated controls.



Lasers stimulate stem cells for heart repair (Uri Oron, Tel Aviv)

PHOTO ACTIVATION of Stem Cells with Laser

Induction of Autologous Bone-Marrow Stem Cells by Low-Level Laser Therapy Has Beneficial Effects on the Kidneys Post-Ischemia-Reperfusion Injury in the Rat
Authors: Hana Tuby, Lidya Maltz, Uri Oron



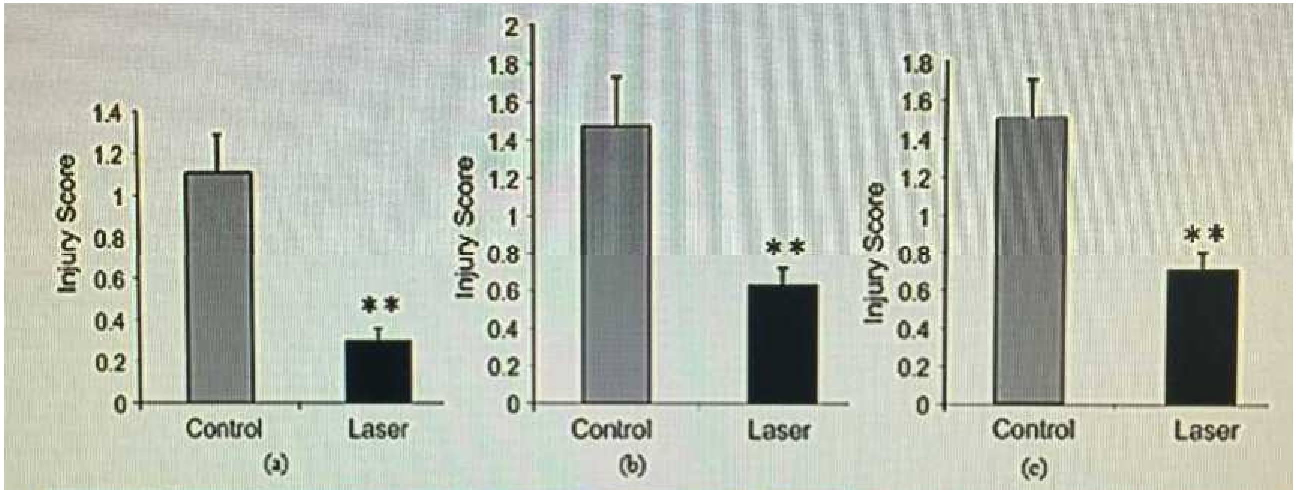
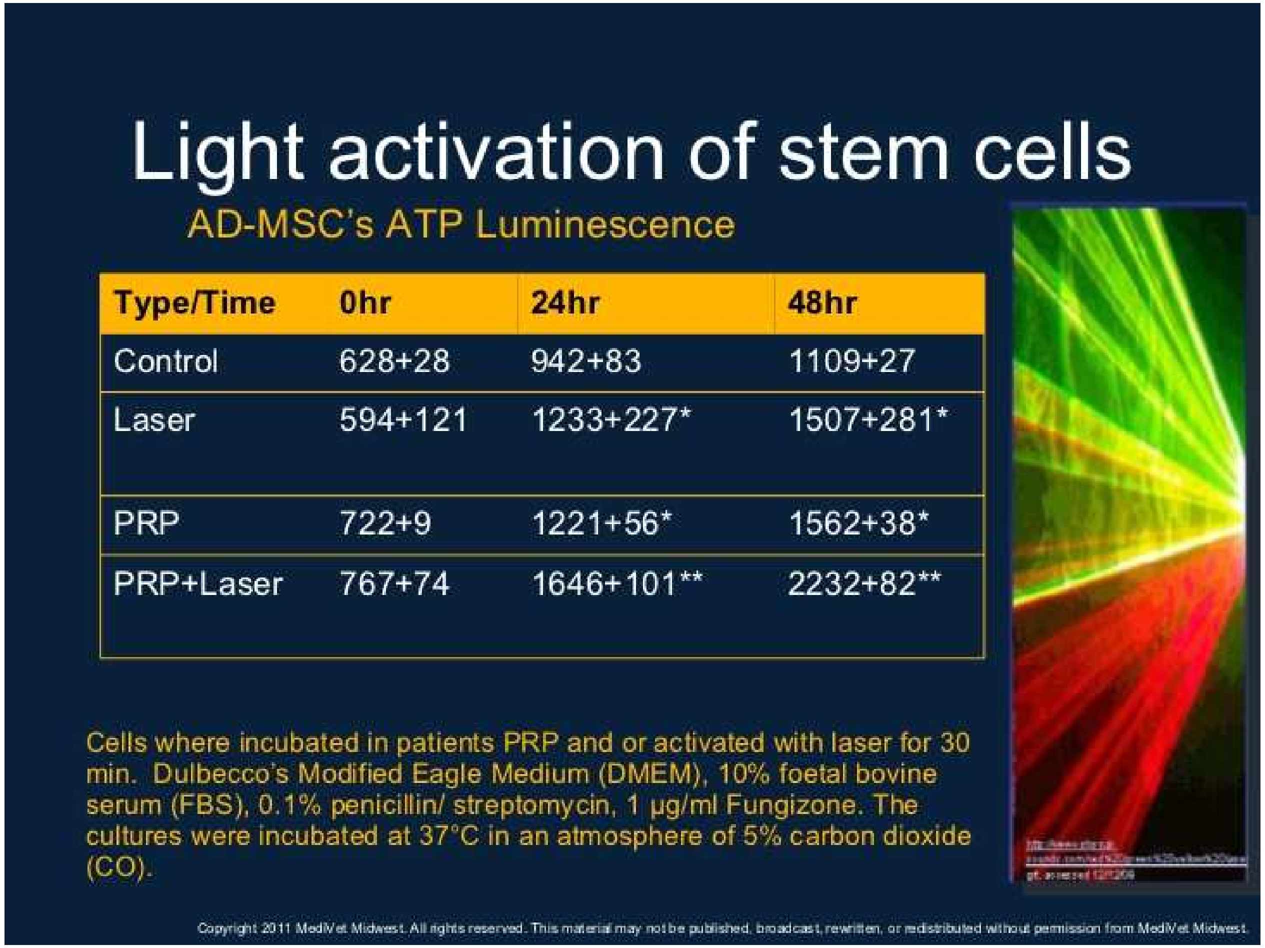


Figure 2. Effect of LLLT application to the bone marrow on the histopathological features of the kidney as reflected in the arbitrary score in non laser (open column) and laser-treated (solid column) rats. Results from 2-3-month-old rats that underwent 15 and 30 min IRI are presented in (a) & (b) respectively. Results from 7-month-old rats are presented as (c). $^{**}p < 0.01$.

PHOTO ACTIVATION of Stem Cells with Laser



Light activation of stem cells

AD-MSC's ATP Luminescence

Type/Time	0hr	24hr	48hr
Control	628+28	942+83	1109+27
Laser	594+121	1233+227*	1507+281*
PRP	722+9	1221+56*	1562+38*
PRP+Laser	767+74	1646+101**	2232+82**

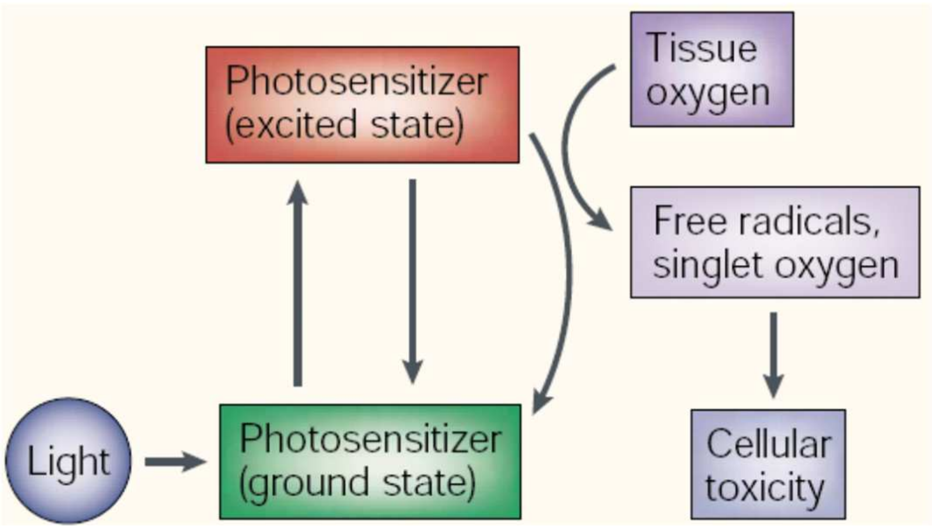
Cells where incubated in patients PRP and or activated with laser for 30 min. Dulbecco's Modified Eagle Medium (DMEM), 10% foetal bovine serum (FBS), 0.1% penicillin/ streptomycin, 1 µg/ml Fungizone. The cultures were incubated at 37°C in an atmosphere of 5% carbon dioxide (CO).

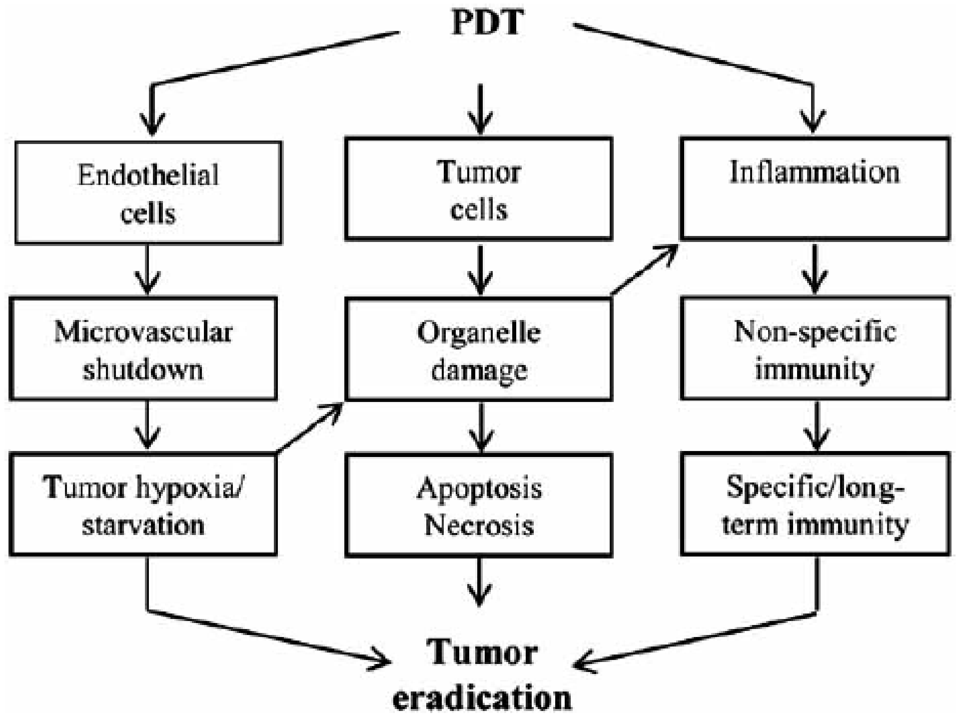
http://medivetmidwest.com/

Photodynamic Therapy for Cancer and Infections

Principle:
2 individually non-toxic components brought together to cause harmful effects on cells and tissues:

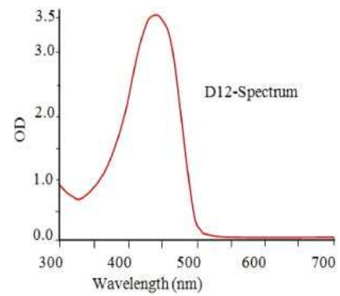
1. Photosensitizing agent
2. Light of specific wavelength



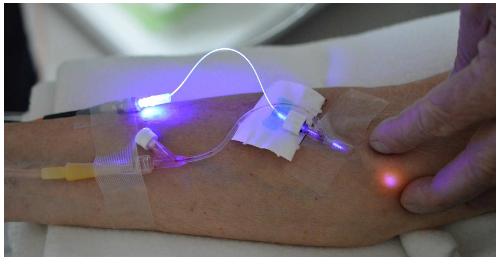


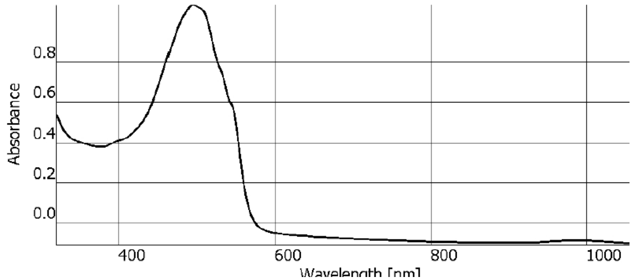
Photodynamic Therapy for Cancer and Infections

- Photodynamic therapy is one of the most interesting and promising approaches in the treatment of various cancers.
- The principle is the stimulation of a light sensitive drug which is injected into the blood (or given orally) and accumulates in cancer cells
- Tumor tissue is subsequently destroyed by irradiation with light of appropriate wavelength according to the absorption spectra of the various photosensitizers (by development of ROS)
- Intravenous laser therapy in combination with photosensitive substances kills circulating tumor cells and stimulates the immune system (should be combined with local irradiation of cancer tissue)
- Common photosensitizers: Chlorin/Chlorophyllin, Curcumin (Turmeric), Hypericin (St. John's Wort), liposomal Indocyaningreen (ICG), Riboflavin, Phycocyanin
- Several chemo drugs are light-sensitive as well and can be enhanced by intravenous laser significantly (with lower dosage), i.e. Doxorubicin, Mitoxantron, Paclitaxel, Cisplatin or 5-FU



Light Absorption of Curcumin



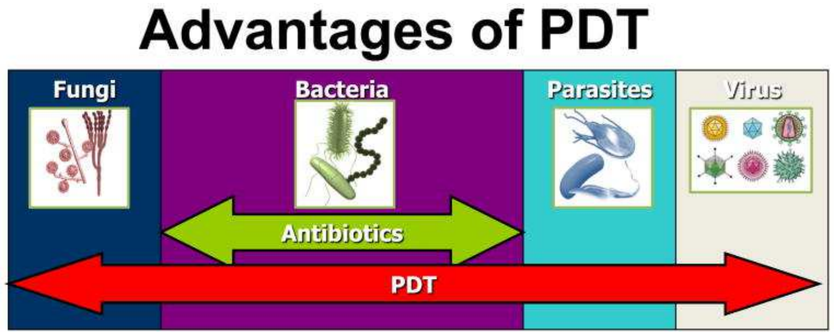


Light Absorption of Doxorubicin

Photodynamic Therapy for Cancer and Infections

- Treatments that aim to kill microbial pathogens can be conducted analogous to treatments that are already used in tumor therapy. The treatment is then called Anti-microbial Photodynamic Therapy (aPDT)
- Photosensitizers such as Riboflavin, Curcumin or Hypericin are binding to pathogens with high specificity and are then irradiated with intravenous lasers to deactivate pathogens within the blood
- Ultraviolet iv laser can be given additionally for pathogen deactivation and immune stimulation

- Besides high-dosage infusions there are also highly effective oral supplements with special formulations for increased bioavailability and pathogen specificity available for photodynamic therapy now



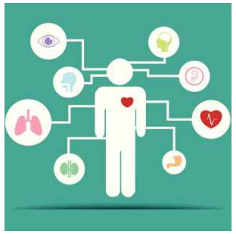
UltraCur+

Curcumin with 15.000-fold increased bioavailability

PhotoActive+

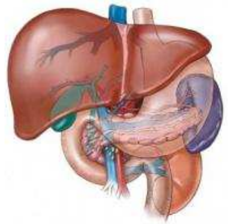
Chlorophyllin and Phycocyanin Complex

Areas of Application:



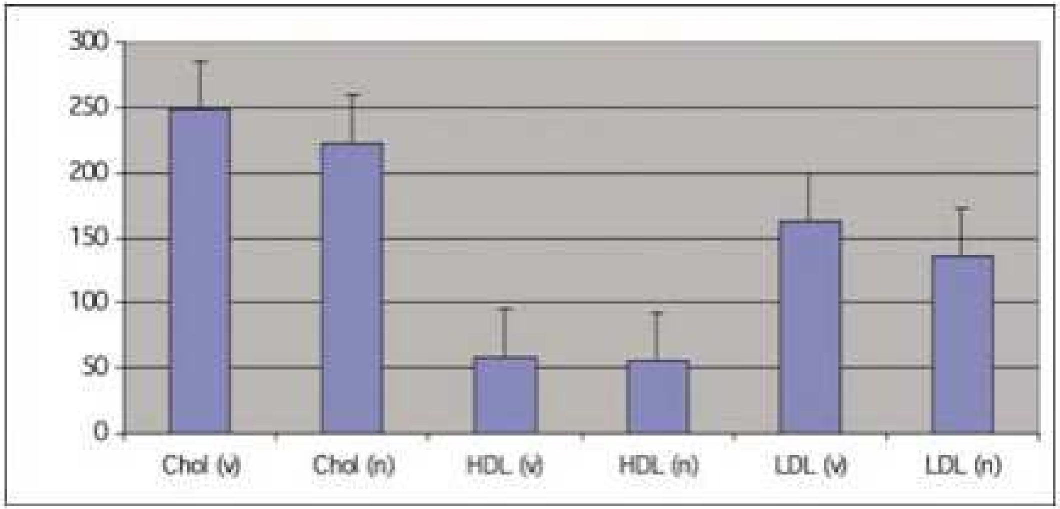
- Internal Diseases (Diabetes, chronic liver and kidney diseases)
- Metabolic disorders
- Cardiovascular diseases
- Chronic pain
- Fibromyalgia and rheumatism
- Allergies
- (Chronic) Inflammation
- Hypertension
- Auto-immune diseaes
- Macular degeneration
- Tinnitus
- Multiple Sclerosis
- Depression, fatigue-syndrome and burn-out
- Lyme disease
- Chronic infections and infectious diseases
- Anti-Aging
- Stem Cell Therapy
- General performance increase (in sports)
- Adjuvant Cancer Therapy (in combination with photosensizing agents)

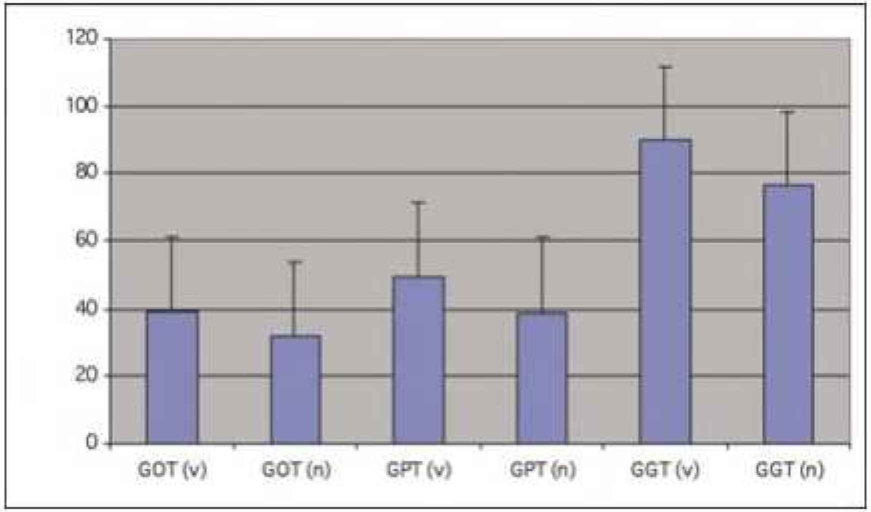
Important Studies (1): Chronic Liver Disease



Weber, M./ Fussgäner, T./ Wolf, T. (2010): Intravenous Laser Blood Irradiation: Introduction of a New Therapy:

35 patients with chronic liver disease had been treated with intravenous red laser (10 sessions). The results of the Russian literature could be confirmed to a great extent. Actually there was a significant decrease of chronically increased liver and lipid parameters (esp. reduction of LDL-Cholesterol). In diabetic patients a drop of pathological HbA1c counts was observed.





Important Studies (2): Diabetes

Wirz, A. (2008): Frequencies With Consequences. Pilot Study for Treating Diabetes

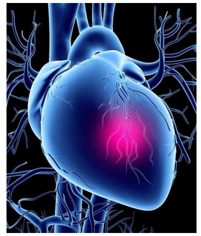
Blood sugar levels were assessed before and after 200 applications of intravenous low level laser therapy.

The results were as follows:

An average decrease of 1,54 mmol/lt in 70,5, %, an average increase of 0,82 mmol/lt in 28 %, whereas blood sugar remained unchanged in 1,5 %.

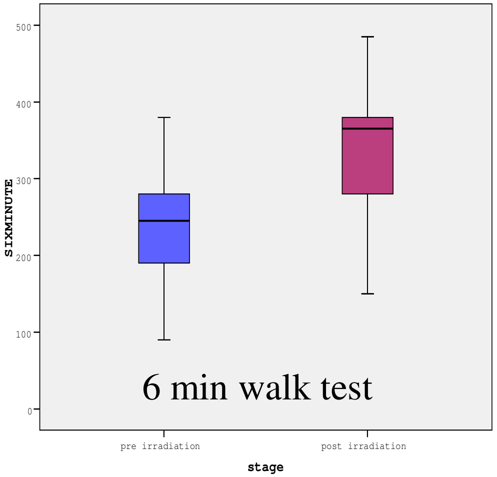
Long-term sugar HbA1C was reduced by an average of 1,23%.

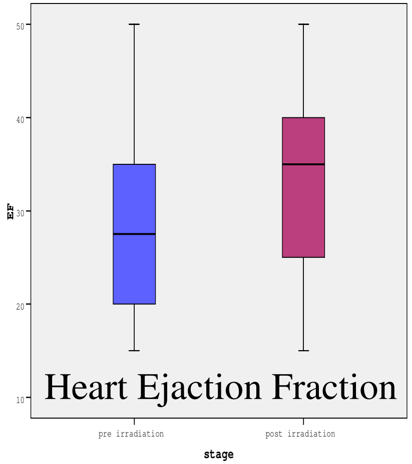
Important Studies (3): Cardiovascular Disease

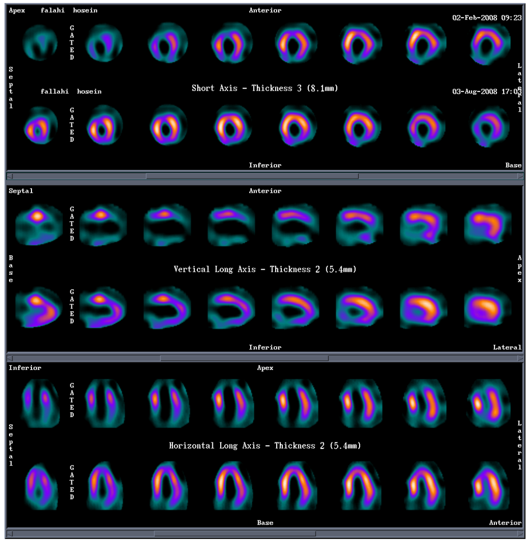


F. Noohi, MD. FACC , M. Javdani, MD*, M. Kiavar, MD (2008): Study of the Efficacy of Low level laser in Myocardial perfusion of patients with chronic stable angina

Shaheed Rajaei Cardiovascular Medical & Research Center. IRAN University of Medical Science, Tehran, IRAN. In collaboration with the American college of cardiology







Results:

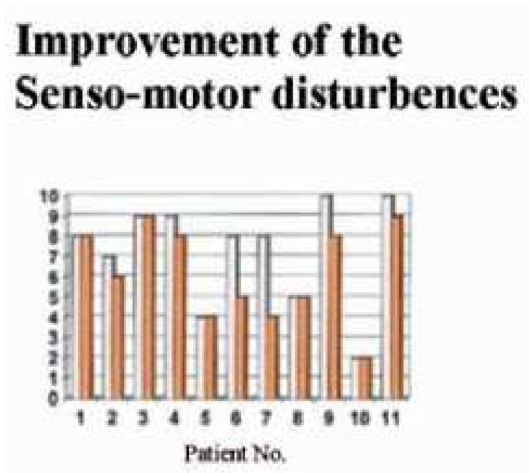
Improvement in SBP, higher functional class, longer distance of 6-min walk test in both groups were noted. There was significant change in myocardial heart by single photon emission computed tomography (SPECT) (visually and by computer soft ware)($P<0.05$).

Important Studies (4): Multiple Sclerosis

Schumm, N. (2006): Intravenous Laser Therapy: A Pilot Study for Treatment of Multiple Sclerosis

Schumm, N. (2008): Intravenous Laser Blood Irradiation in Multiple Sclerosis: A New Therapeutic Procedure with Significant Improvement in Quality of Life

Conclusion:
According to the experiments of the author, there is no established therapy available for successful treatment of the fatigue syndrome in MS-like conditions besides iv laser.



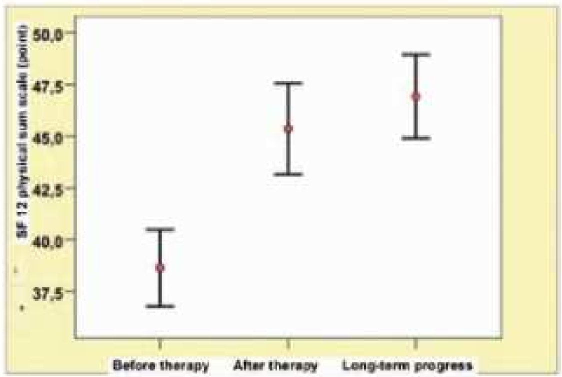


Fig. 3: Physical sum scale before and after the therapy. The mean as well as standard deviation is shown.

Important Studies (5): Fibromyalgia

Wieden, T. (2009): Fibromyalgia in Pain Therapy. Mechanisms and Treatment Opportunities in Laser Therapy

Pain Rating:

	Onset	End
MED	8.7	6.8
ACU	8.5	6
LAS	8.5	4.4
LAS+IV	8.9	2.9

Depression Rating:

	Onset	End
MED	34	23
ACU	37	24
LAS	42	12
LAS+IV	40	12

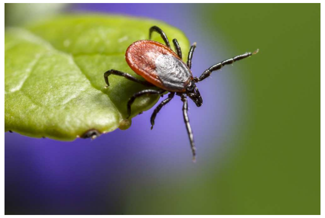
MED = medication procedure, ACU = needle acupuncture, LAS = laserneedle acupuncture, LAS+IV = combination of laserneedle acupuncture with intravasal laser irradiation.

Laser Rating:

	Onset	End
Sense of well-being	30	70
Veg. score	51	21
Affective comp.	48	31

When measured on the score estimated by the patients themselves for affective and vegetative adverse effects as well as for their general well-being, all values of the laser treatment after five weeks showed a significant improvement when compared with those at the beginning of the therapy.

Important Studies (6): Lyme Disease



Zuern, I. (2016): Pilot Study on Treatment of Chronic Lyme Disease with Yellow and Blue Laser

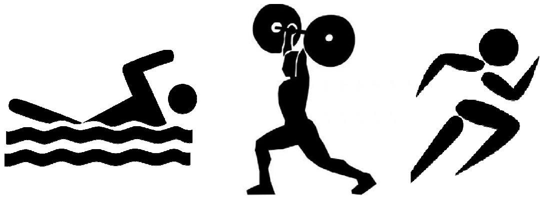
Lymphocyte Transformation Test*: Results in patients with chronic lyme disease

*Diagnostic tool for detection of the activity of chronic, persistent infections based on pathogen-specific T cell response (Borrelia, Chlamydia, Yersinia, Giardia lamblia, Herpes viruses, among others).

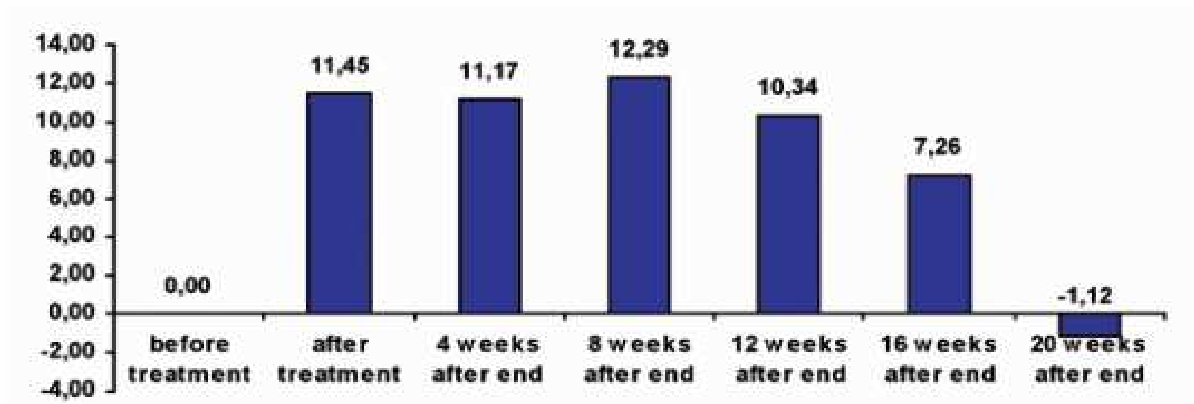
Index >3,0 positiv   Index 2,0-3.0 borderline Index <2,0 negativ

	Before Therapy	3-6 months later
Group 1 (n=10) Standard Therapy	6,8	3,1
Group 2 (n=10) Standard Therapy + Yellow Laser 589nm	7,1	2,4
Group 3 (n = 10) Standard Therapy + Blue Laser 447nm	9,1	1,5

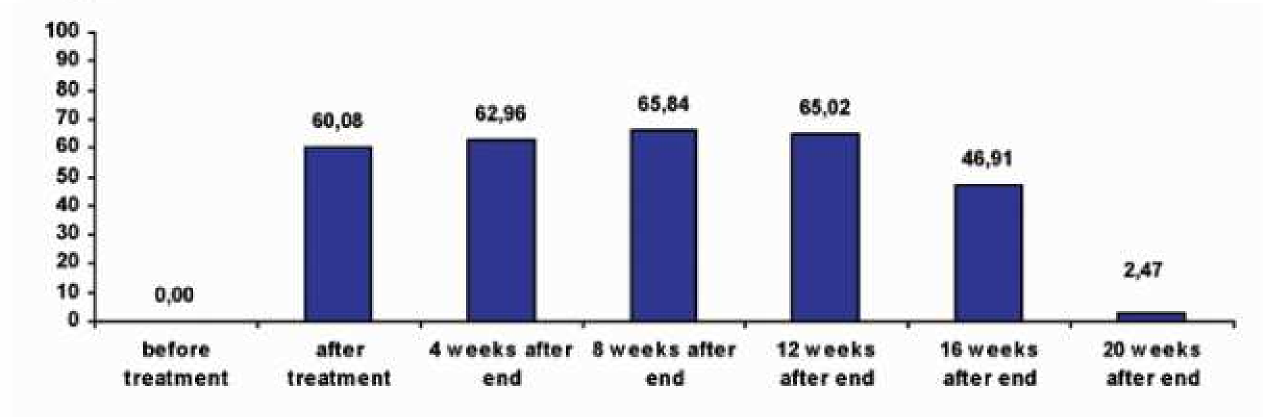
Important Studies (7): Physical Fitness



Raggi, F./ Vallesi G. (2008): Intravenous Laser Blood Irradiation in Sports Medicine



Mean pectoral muscle maximum lifting power percentage variation at any time of measurement



Number of swimming pool lanes: mean percentage variation at any time of measurement

Important Studies (7): Physical Fitness

Raggi, F./ Vallesi G. (2008): Intravenous Laser Blood Irradiation in Sports Medicine

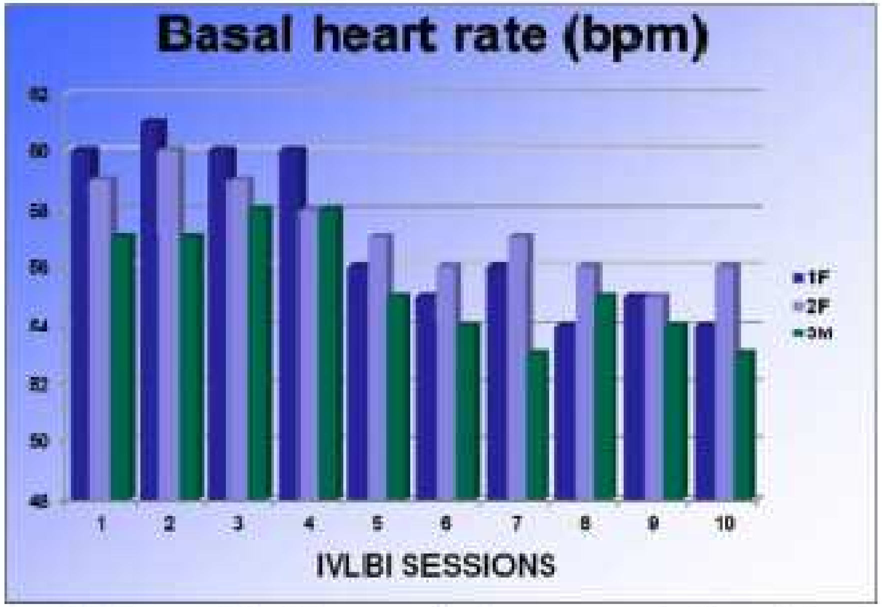


Fig. 49: Reduction of basal heart rate after 10 treatments in 3 athletes (f= female, m=male)

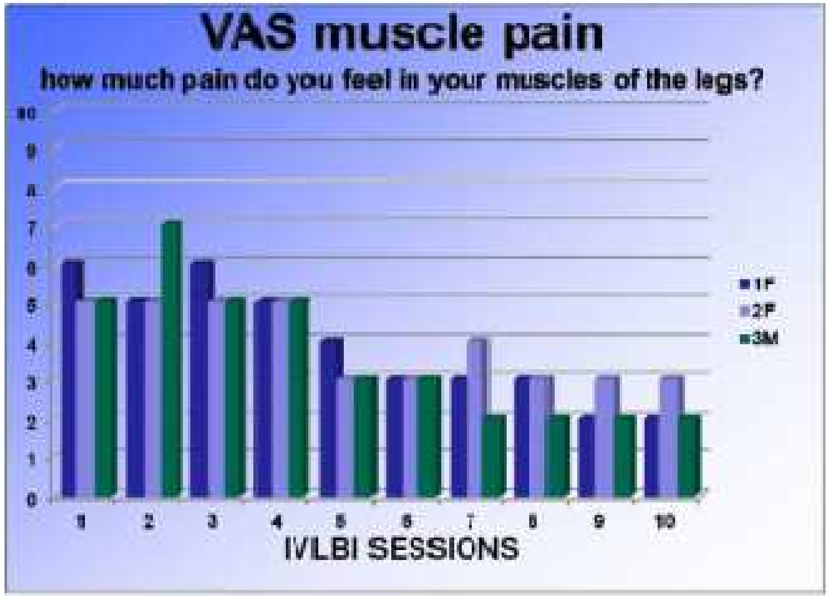
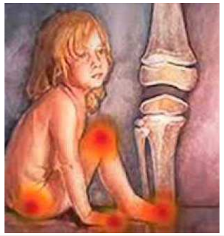


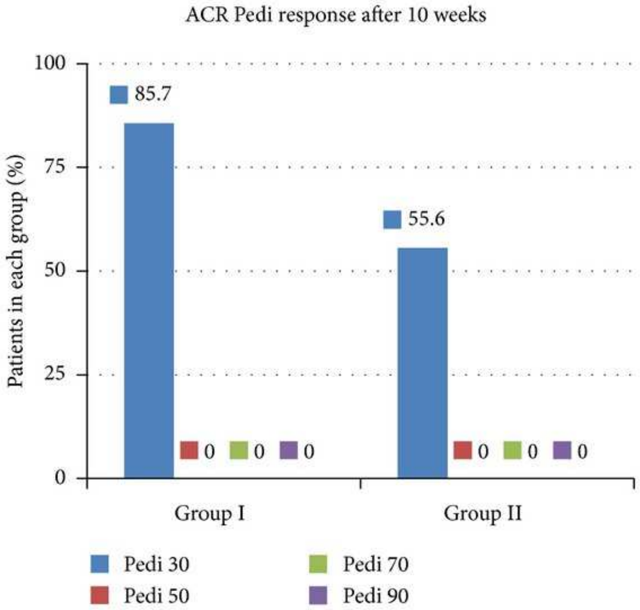
Fig. 52: Reduction of muscle pain after 10 treatments in 3 athletes (f= female, m=male)

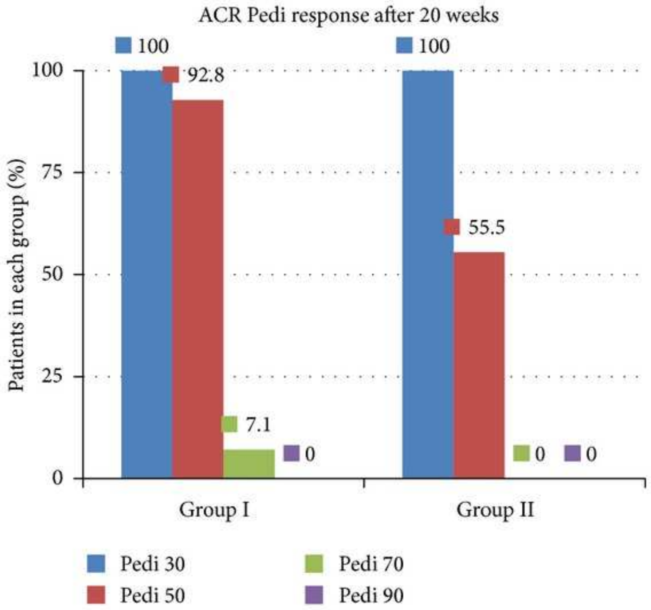
Important Studies (8): Juvenile Idiopathic Arthritis



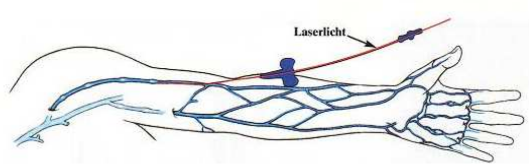
Ailioaie L. et al. (2013): Intravenous Laser Blood Irradiation Increases Efficacy of Etanercept in Selected Subtypes of Juvenile Idiopathic Arthritis - An Innovative Clinical Approach

Disease improvement was evaluated using the ACR Pediatric (ACR Pedi) criteria. The ACR Pedi 30 (50, 70, and 90, resp.) criteria are defined as improvement of more than 30% (50%, 70%, and 90%, resp.), in at least 3 of the 6 core set variables used to assess disease activity, with no more than one variable worsening by more than 30%. **Group 1 = Laser, Group 2 = Placebo**

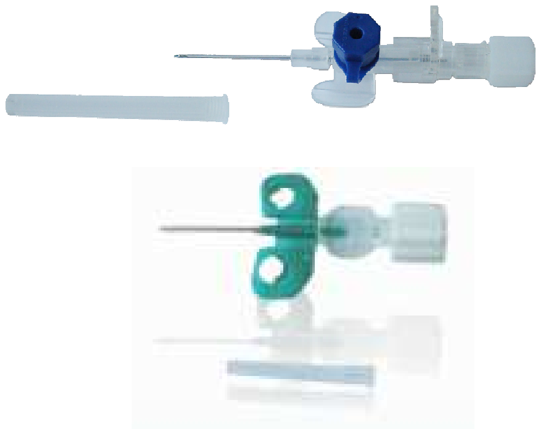


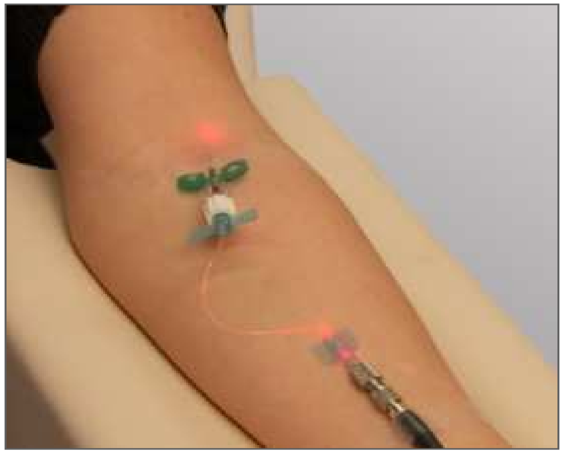


Application of Intravenous Laser Therapy:



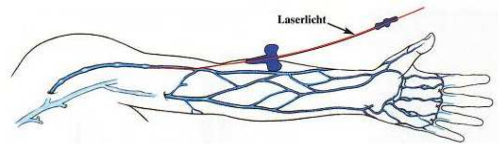
Demonstration video: https://www.youtube.com/watch?v=Ika1GkefjSU&feature=youtu.be





For application of intravenous laser the physician can chose between a standardized 22G canula (blue) or our specific weberneedle® butterfly.
After placing the canula (or butterfly) into the vein the so-called laser catheter (sterile weberneedle® lasercath) is inserted into the canula.
The laser is then connected to the lasercath guiding the light directly into the flowing blood.
No saline or other fluid is needed.

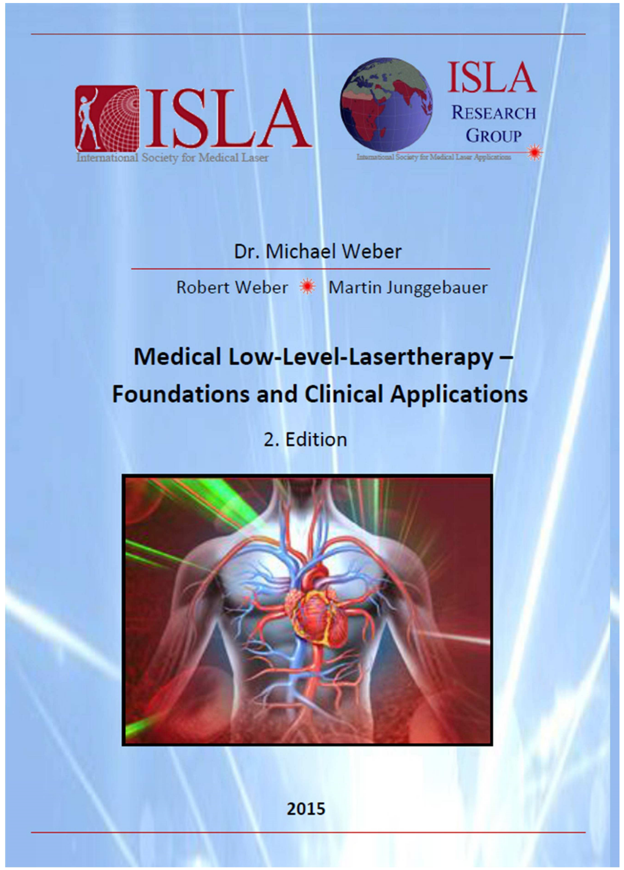
Application of Intravenous Laser Therapy:



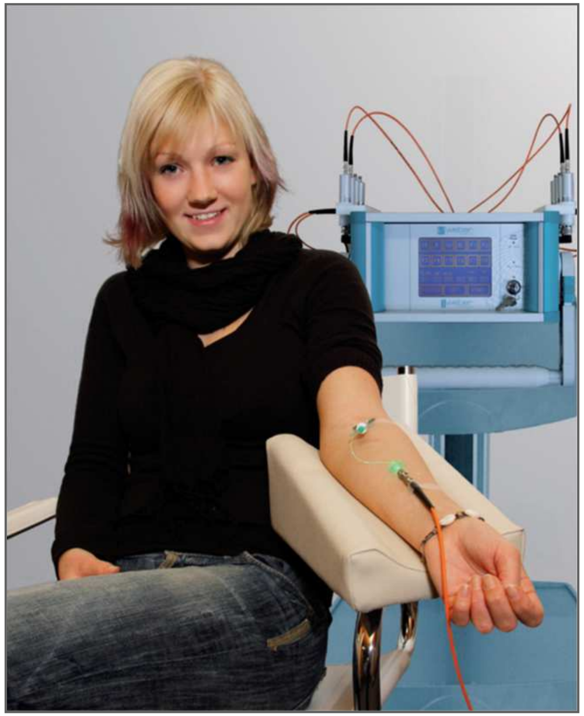
New Development: Y-Canula (3-way canula) for infusion and intravnous laser

Application and Protocols:

- Basically all different wavelengths (colors) are used in most conditions to benefit from a maximum of cellular effects
- Usually each laser color is used for 10-15 minutes (treatment time about 60 min. in total). Power settings can be programmed individually
- In many conditions specific protocols (i.e. combination with specific light-sensitive infusions or supplements) are used
- For detailed protocols we are offering a comprehensive textbook. Details can be found at www.isla-laser.org



Patients Experience:



- Simple, comfortable process
- Patient relaxes for 60-minutes during treatment
- No further downtime
- No negative side effects
- Can be integrated into standard workflows for clinics and combined with other therapies (i.e. infusion, oxygen therapy, stem cell therapy etc.)

Safety / Risks:

- Side-effects are very unlikely due to the administered low power of the lasers
- This is confirmed by all clinical data (millions of treatments) as there was no report on any serious side effects of intravenous laser blood irradiation until today
- In addition, there is a huge amount of data from about 30 years of use in thousands of clinics in Russia and other Eastern European countries where no serious side effects have been described until today, too.
- Nevertheless, a conforming education of the patient should take place when using this treatment in a country where it is not well-established yet. It is recommended to explain this new therapy to the patient in detail and let him sign a document for informed consent.

References:

1. Ailioaie et. al (2011): Laser Regeneration of Nerve Injuries in Children
2. Aluani, P. (2007): Intravenous Laser Therapy: Case Reports from the Field
3. Andrae, F. (2007): The Effects of intravascular Low Level Laser Therapy in the Scope of a Redifferentiation Therapy of Malignant Tumors
4. Bakeeva L, Manteiffel V, Rodichev E, Karu T. Formation of gigantic mitochondria in human blood lymphocytes under the effect of an He-Ne laser. Mol-Biol-Mosk. 1993 May-Jun; 27 (3):608-17
5. Boev S, Selivonenko V. The impact of the intravenous He-Ne-Laser therapy on the antioxidant system in patients with stable insertion angina and postinfarkt cardiosclerosis. Klin-Med-Mosk, 1997; 75,12:30-3
6. Brill G, Grigoriev S, Romanova T. Changes of leucocyte metabolism in He-Ne laser blood irradiation in vitro. Proceedings of SPIE. 1993; 1981:204-209
7. Dimitriev A, Iudin V, Aparov N, Matyrnov V. Effect of intravascular laser irradiation of the blood on blood cells in pancreatitis. Klin Med (Mosk.). 1989; 67, 5:108-110
8. Driianskaia V. The clinico-immunological effects of immunotherapy in patients with acute pyelonephritis. Lik-Sprava. 1997; Jul- Aug; (4):89-92
9. Dube A, Hausal H, Gupta PK. Modulation of macrophage structure and function by low level He-Ne irradiation. Photochem. Photobiol. Sci. 2003; 2, 8:851-855
10. Funk J, Kruse A, Kirchner H. Cytokine production after helium-neon laser irradiation in cultures of human peripheral blood mononuclear cells. Journal Photochem. Photobiol. Biology, 1992; 16, 3-4: 347-355
11. Gasparyan L. Laser Irradiation of the blood. Laser Partner - Clinixperience - All Volumes - 2003:1-4
12. Gordon WC, Casey DM, Lukiw WJ, Bazan NG. DNA damage and repair in light-induced photoreceptor degeneration. Invest Ophthalmol Vis Sci. 2002;43(11):3511-21

References:

13. Gulsoy M, Ozer G, Bozkulak O, Tabakoglu H, Aktas E, Deniz G, Ertan C. LLLT increases lymphocyte proliferation. Journal Photochem. Photobiol. Biology, 2006; 82, 3:199-202
14. Hamblin R, Viveiros J, Changming Y, Ahmadi A, Ganz R, Tolkoff J,. helicobacter pylori accumulates photoactive porphyrins and is killed by visible light. Antimicrobial Agents and Chemotherapy, 2005; 49, 7:2822-2827
15. Heine H, Schaeg G: Origin and function of „roodlike structures“ in mitochondria. Acta anat. 1979; 103:1-10
16. Heine H. Lehrbuch der biologischen Medizin. Stuttgart: Hippokrates, 3. Auflage 2007
17. Humpeler E, Mairbaurl H, Honigsmann. Effects of whole body UV-irradiation on oxygen delivery from the erythrocyte. Eur J Appl Physiol. 1982; 49:209-2014
18. Ivaniuta OM, Dziublik AIa, Skopichenko VN. Optimal effectiveness of complex treatment of patients with chronic obstructive bronchitis by intravascular laser irradiation of blood. Probl Tuberk. 1992;(5-6):21-4.
19. Karp G. Molekulare Zellbiologie. Heidelberg: Springer, 4. Auflage 2005
20. Karu T. Ten Lectures on Basic Science of Laser Phototherapy. Gangesber, Sweden: Prima Books AB (2007)
21. Karu T. The Science of Low-Power Laser Therapy. Amsterdam: Gordan and Breach Science Publishers, 1998
22. Karu, TI, Afanasyeva, NI. Cytochrome oxidase as primary photoacceptor for cultured cells in visible and new IR regions. Doklady Akad Nauk. 1995;342:693-695.
23. Kassak P, Sikurova L, Kvasnicka P, Bryszewska M. The response of Na/K-Atpase of human erythrocytes to green laser light treatment. Physiol Research, 2006; 55,2:189-194
24. Khotiaintsev K, Doger-Guerrero E, Glebova I, Svirid V, Sirenko J. Laser blood irradiation effect on electrophysiological characteristics of acute coronary syndrome patients. Proc. SPIE. 2929: 1996:132-137

References:

25. Kipshidze N, Chapidze G, Bokhua M, Marsagishvili L. Effectiveness of blood irradiation using a Helium-Neon-Laser in the acute period of myocardial infarction. Sov-Med. 1990; 3:9-12

26. Kolarova H, Ditrichova D, Smolan S. Effect of He-Ne laser irradiation on phagocytotic activity of leukocytes in vitro. Acta-Univ-Palcki-Olmuc-Fac-Med. 1991; 129:127-132

27. Kozhura V, Dvoretskii S, Novoderzhkina I, Berezina T, Kirsanova A, Iakimento D, Kozinets GI. The effect of intravascular helium neon laser blood irradiation on the state of the compensatory processses in the acute period of hemorrhagic shock and after resuscitation. Anesteziol Reanimatol. 1993; 4:43-8

28. Kreisler M, Christoffers AB, Al-Haj H, Willershausen B, d'Hoedt B (2002). Low-level 809-nm diode laser-induced in vitro stimulation of the proliferation of human gingival fibroblasts. Lasers Surg Med 30(5):365–369

29. Ledin A, Dobkin V, Sadov A, Galichev K, Rzeutsky V. Soft-laser use in the preoperative preparation and postoperative treatment of patients with chronic lung abscesses. Proc. SPIE. 1999; 3829:2-5

30. Leonova G., Maistrovskaia O, Chudnovskii V. Helium-neon laser irradiation as inducer of interferon formation. Vopr-virosol. 1984; 39, 3:119-121

31. Lim WB, Kim JS, Ko YJ, Kwon H, Kim SW, Min HK, Kim O, Choi HR, Kim OJ. Effects of 635 nm light-emitting diode irradiation on angiogenesis in CoCl -exposed HUVECs. Lasers Surg Med. 2011;43(4):344-52.

32. Lindgard A, Hulten L, Svensson L, Soussi B. Irradiation at 634 nm releases nitric oxide from human monocytes. Lasers Med Sc 2007; 22:30-36

33. Litscher G./ Chiran/ Weber/ Ailioaie L./ Ailioaie C./Litscher D. (2013): Intravenous Laser Blood Irradiation Increases Efficacy of Etanercept in Selected Subtypes of Juvenile Idiopathic Arthritis - An Innovative Clinical Approach

34. Lutoshkin M, Tsypilev M, Lutoshkina M. Application of a Helium-Neon Laser (HNL) for the correction of renal function in patiets with chronic glomerulonephritis. Uro. Nefrol (Mosk.). 1993; 2:17-20

35. Manteifel V, Bakeeva L, Karu T. Ultrastructurel changes in chondriome of human lymphocytes after irradiation with He-Ne laser: appearance of giant mitochondria. Journal Photochem. Photobiol. Biology, 1997; 38, 25-30:

References:

36. Manteifel V, Karu T. Structure of Mitochondria and Activity of their Rspiratory Chain in successive Generations of Yeast Cells exposed to He-Ne Laser Light. Biology Bulletin 2005; 32, 6:556-566
37. Meshalkin E. (ed.) Application of Direct Laser Irradiation in Experimental and Clinical Heart Surgery [in Russian], Novosibirsk: Nauka, 1981
38. Mi X, Chen J, Cen Y, Liang Z, Zhou L. A comparative study of 632,8 and 532 nm laser irradiation on some rheological factors in human blood in vitro. J. Photochem. Photobiol. B., 2004; 74,1:7-12
39. Miley G, Christensen. Ultraviolet blood irradiation therapy: Further studies in acute infections. American Journal of Surgery. 1947;73(4):486-493.
40. Miley, G. Efficacy of ultraviolet blood irradiation therapy and control of Staphylococcemias. American Journal of Surgery. 1942;64(3):313-322
41. Miley, G.: The Knott Technique of ultraviolet blood irradiation in acute pyogenic infections. New York State Journal of Medicine. 1942: 38- 46.Pathogen Deactivation
42. Mittermayr et al. (2007): Blue Laser Light Increases Perfusion of a Skin Flap Via Release of Nitric Oxide from Hemoglobin. Mol Med. 2007 Jan-Feb; 13 (1-2): 22-29:
43. Mouayed A, Fareed F, Ihsan F, Ahmad Y. Estimation of IgM & IgG values in the serum after intravenous irradiation of blood with diode laser. First UAE International Conference on Biological and Medical Physics, Al-Ain. 2005; Abstract No. 70
44. Noohi/ Javdani/ Kiavar (2008): Study of the Efficacy of Low Level Laser in Myocardial Perfusion in Patients with Chronic Stable Angina
45. Raggi, F./ Vallesi G. (2008): Intravenous Laser Blood Irradiation in Sports Medicine
46. Ramabhadran TV, F. T. (1976). In vivo induction of 4-thiouridine-cytidine adducts in tRNA of E. coli B/r by near-ultraviolet radiation. Photochem Photobiol, 23(5), 315-21.
47. Ramabhadran TV, J. J. (1976). Mechanism of growth delay induced in Escherichia coli by near ultraviolet radiation. PNAS, 73(1), 59-63.

References:

48. Safavi SM , Kazemi B, Esmaeili M, Fallah A, Modarresi A, Mir M. Effects of low-level He-Ne laser irradiation on the gene expression of IL-1beta, TNF-alpha, IFN-gamma, TGF-beta, bFGF, and PDGF in rat's gingiva. Lasers Med Sci. 2008 Jul;23(3):331-5. Epub 2007 Sep 5
49. Schmidt S, K. J. (2007). Process and Laboratory Scale UV Inactivation of Viruses and Bacteria Using an Innovative Coiled Tube Reactor. Chemical
50. Schulte-Uebbing, C. (2014): Intravenous Laser Therapy as an Integrative Approach in Immunology
51. Schulte-Uebbing, C. (2015): Intravenous Laser Therapy in an Integrative Therapy Concept for Treatment of Auto-immune Diseases (Hashimoto‘s Disease)
52. Schumm, N. (2006): Intravenous Laser Therapy: A Pilot Study for Treatment of Multiple Sclerosis
53. Schumm, N. (2008): Intravenous Laser Blood Irradiation in Multiple Sclerosis: A New Therapeutic Procedure with Significant Improvement in Quality of Life
54. Siniukhin VN, Ianenko EK, Safanov RM, Khamaganova EG, Borisik VI. The effect of endovascular helium-neon laser therapy on the immune status of patients with acute calculous pyelonephritis. Urol Nefrol (Mosk). 1996 Nov-Dec;(6):9-11 .
55. Siposan G, Lukacs A. Relative variation to received dose of some erythrocytic and leukocytic indices of huma blood as a result of low-level-laser radiation. Journal of Clinical Laser Medicine & Surgery. 2001; 19, 2:89-103
56. SpasovA, Nedogoda V, Konan K, Kucheriavenko A. Effect of the intravenous laser blood irradiation on efficacy of drug preparations. Eksp Klin Farmakol. 2000; 63, 5:65-7
57. Stadler I, Evans R, Kolb B, Naim J, Narayan V, Buehner N, Lazafame R. In vitro effects of low level laser irradiation at 660 nm on peripheral blood lymphocytes. Lasers Surg. Med. 2000; 27, 3:255-261
58. Stroev E, LarionovV, Grigoreva L, Makarova V, Dubinina I. The treatment of diabetic angiopathies by endo-vascular low-intensity laser irradiation. Probl-Endokrinol-Mosk. 1990; 36, 6:23-5

References:

59. Tuner J, Hode L. Laser Therapy - Clinical Practice and Scientific Background. Grängesberg: Prima Books AB, 2002
60. Vasa/Breitschopf/Zeiher/Dimmeler: Nitric Oxide Activates Telomerase and Delays Endothelial Cell Senescence
61. Vinck E, Cagnie B, Cornelissen M, Declerque H, Cambier D. Green light emitting diode Irridation enhances Fibroblast Growth impaired by high glucose levels. Photomedicine and laser surgery. 2005, 23, 2:167-171
62. Weber et al. (2010): Intravenous Laser Blood Irradiation: Introduction of a New Therapy
63. Wieden, T. (2009): Fibromyalgia in Pain Therapy. Mechanisms and Treatment Opportunities in Laser Therapy
64. Wirz, A. (2008): Frequencies With Consequences. Pilot Study for Treating Diabetes
65. Wirz/ Baumgartner/ Burger/ Gerber (2008): Intravenous Laser Therapy in the Treatment of Horses. Results of a Multi-Center Pilot Study
66. Xuejuan G, Xing D. Molecular mechanisms of cell proliferation induced by low power laser irradiation. J Biomed Sci. 2009;16(1):4
67. Yang Z , Wu Y, Zhang H, Jin P, Wang W, Hou J, Wei Y, Hu S. Low-level laser irradiation alters cardiac cytokine expression following acute myocardial infarction: a potential mechanism for laser therapy. Photomed Laser Surg. 2011 Jun;29(6):391-8. doi: 10.1089/pho.2010.2866. Epub 2011 Feb 24
68. Yu H, Chang K, Yu C, Chen J, Chen G. Low-energy helium-neon laser irradiation stimulates interleukin-1 alpha and interleukin-8 release from cultured human keratinocytes. Journal of investigative Dermatology. 1996; 107:593-596
69. Zhang H, Hou JF, Shen Y, Wang W, Wei YJ, Hu S., Low level laser irradiation precondition to create friendly milieu of infarcted myocardium and enhance early survival of transplanted bone marrow cells. J Cell Mol Med. 2010 Jul;14(7):1975-87. doi: 10.1111/j.1582-4934.2009.00886.x. Epub 2009 Sep 1
70. Zuern, I. (2016): Pilot Study on Treatment of Chronic Lyme Disease with Yellow and Blue Laser