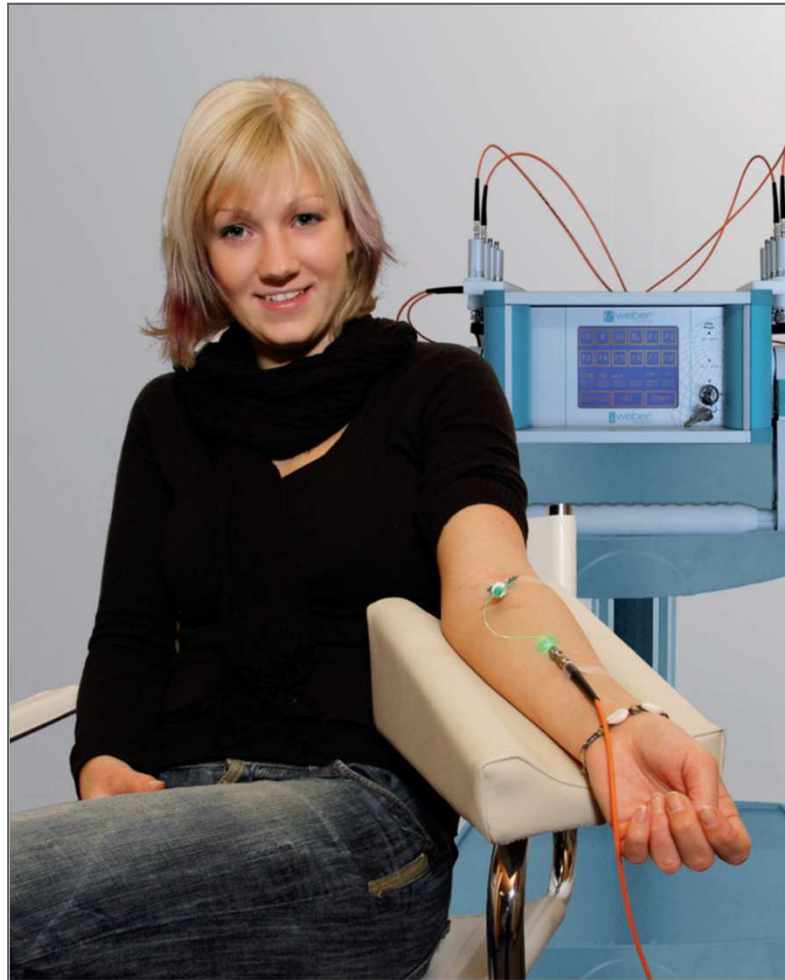
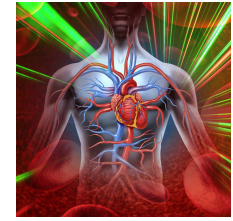
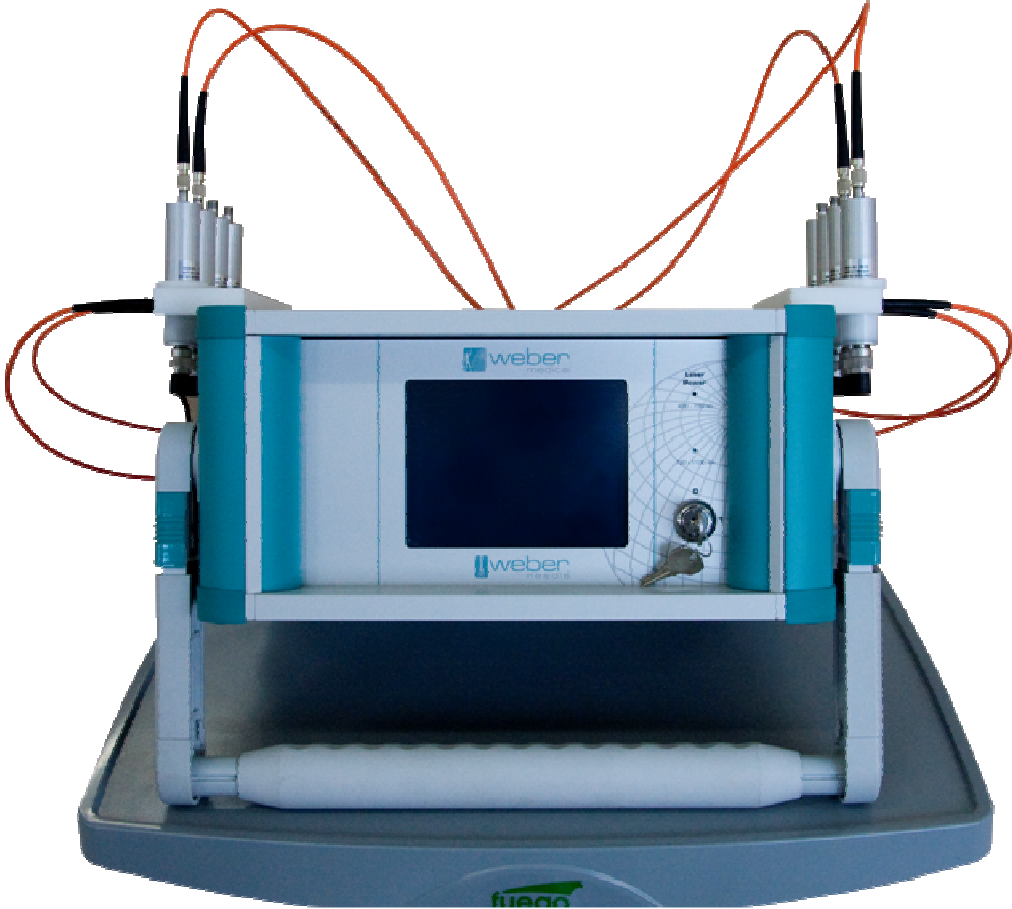


Systemic (Intravenous) Laser Therapy: Scientific Background and Clinical Applications



Dr. med. Dipl. Chem.
Michael Weber,
Lauenfoerde/Germany

Endolaser System with Red, Green, Blue, Yellow and Ultraviolet Light



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



Health
Canada

Santé
Canada



TGA Health Safety
Regulation



Important Studies (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 (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

Research Network:



GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN



ISLA
RESEARCH
GROUP

International Society for Medical Laser Applications

Philipps



Universität
Marburg

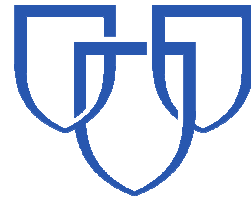


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MAYO
CLINIC



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International Society for Medical Laser Applications



UNIVERSITY OF MEDICAL SCIENCES
ONDO STATE, NIGERIA



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

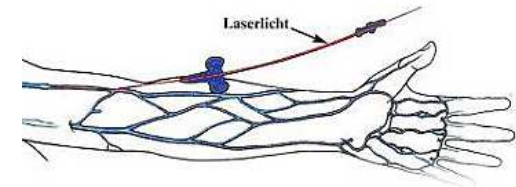
History of Systemic Light Therapy:



1. UV Light Therapy (UVBI):

- In 1903 a Nobel Prize 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

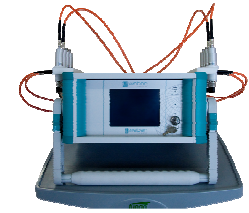
History of Systemic Light Therapy:



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]

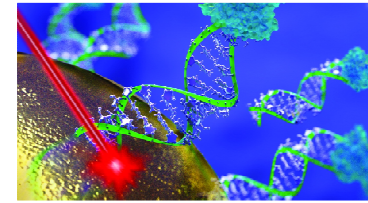
History of Systemic Light Therapy:



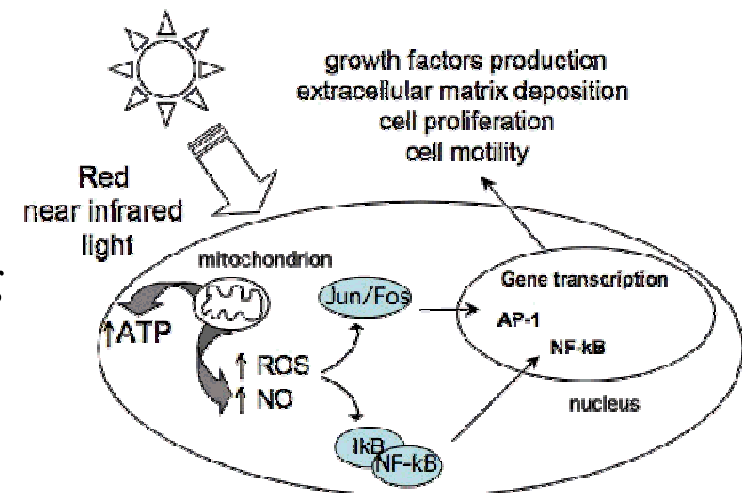
3. Developments in Germany:

- 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 simultaneous 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:



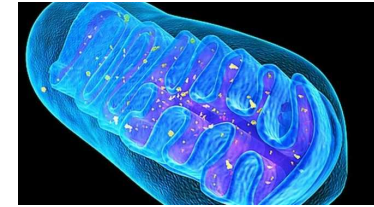
- In general, there are specific cellular structures that are able to absorb specific wavelengths (colors) of light (known as photoreceptors)
- The light stimulus gives a cellular signal affecting the chemical behavior, metabolism, movement and gene expression
- All associated enzymes and/or proteins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



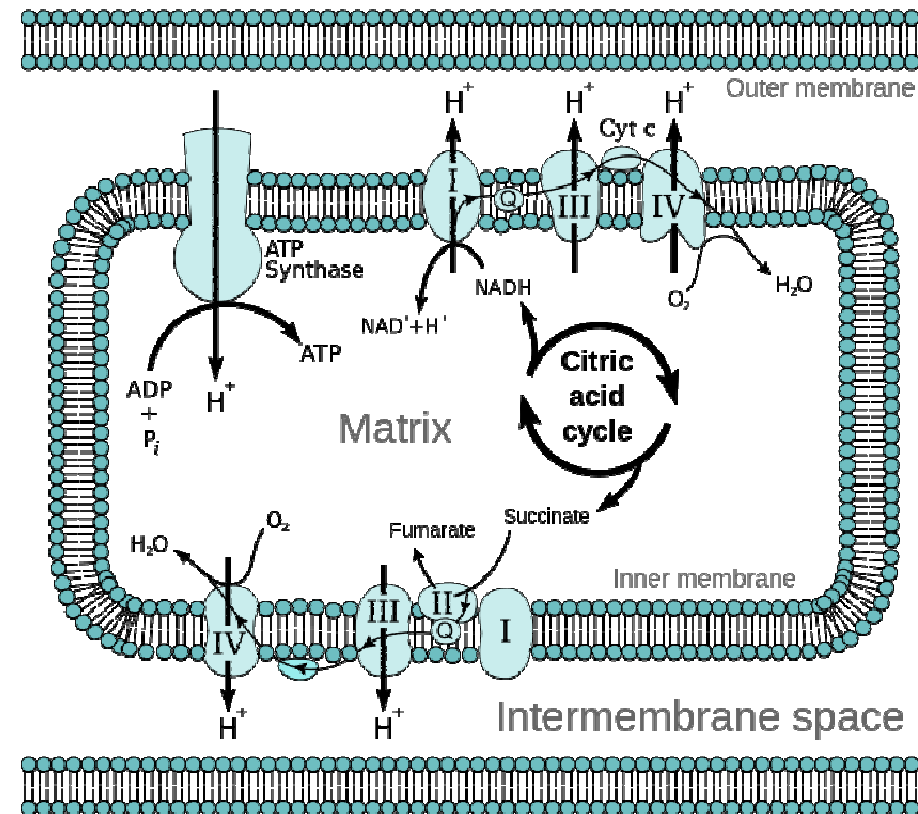
Hamblin:

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

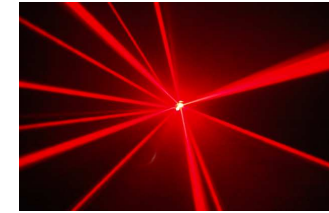
Absorption of Different Light Wavelengths (Colors) in Mitochondria



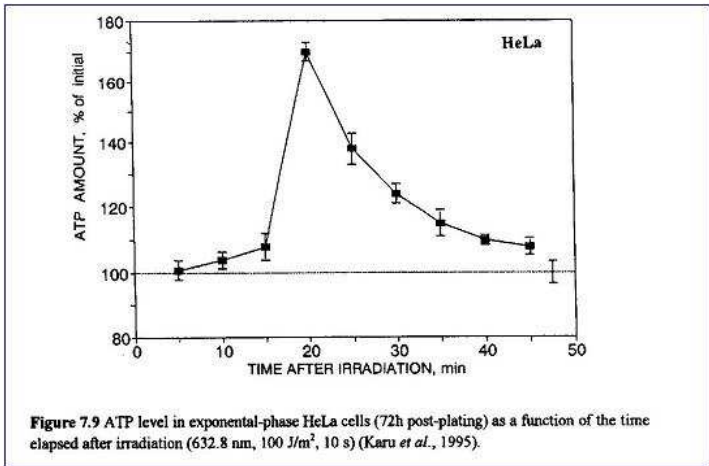
- One example for the absorption of different colors within cells is the process in the mitochondrial respiratory chain [21]
- Complex 1 (NADH dehydrogenase) absorbs blue and ultraviolet light
- Complex 3 (cytochrome c reductase) absorbs green and yellow light
- Complex 4 (cytochrome c oxidase) absorbs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



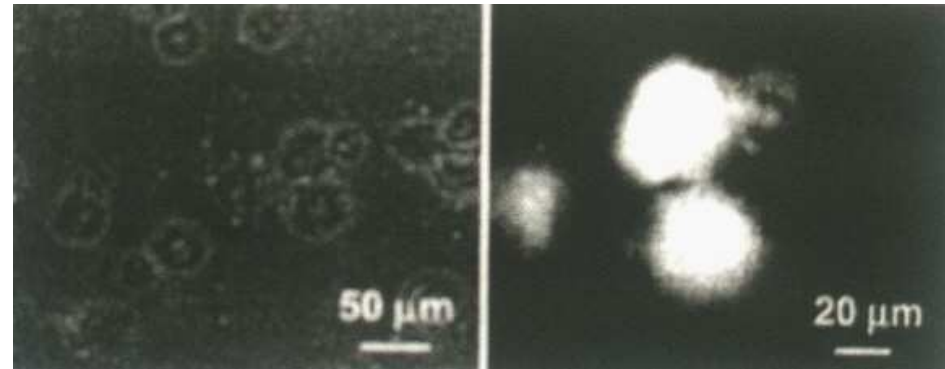
Effects of Red laser:



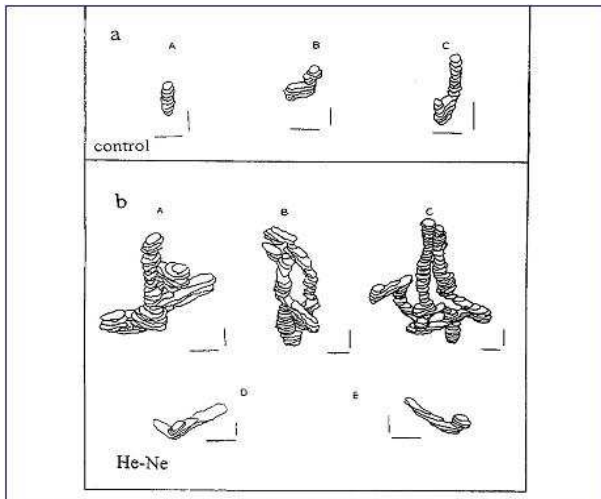
- Positive influence on rheological properties of the blood [58]
- Diminishing tendency of aggregation of thrombocytes and improved deformability of erythrocytes [10, 29]
- Activation of phagocytic activity of macrophages [9, 26]
- Positive effect on the proliferation of lymphocytes and B-and T-cell 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]



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)

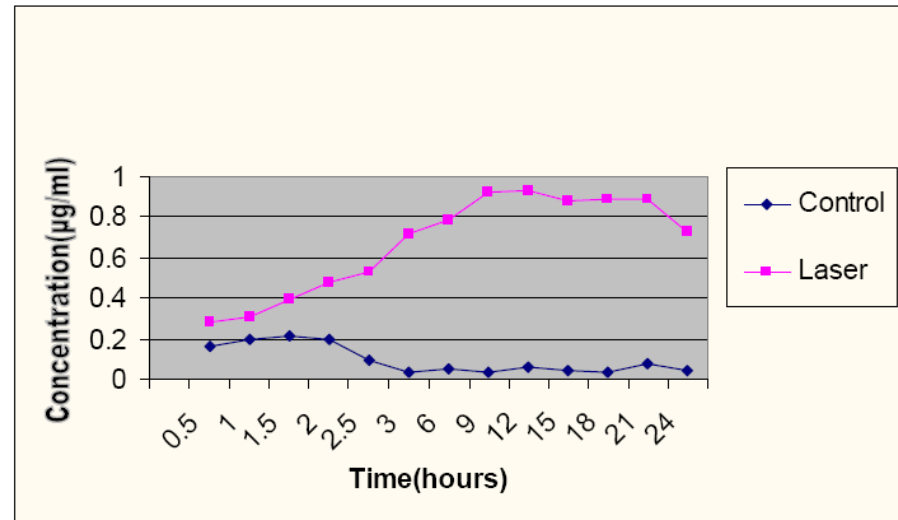
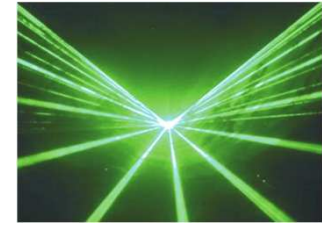
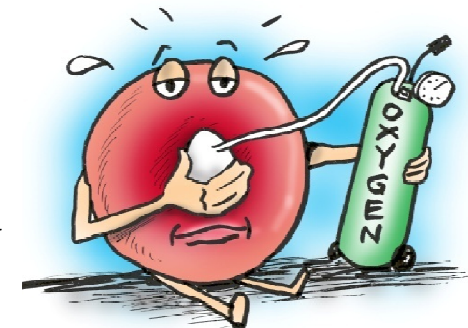
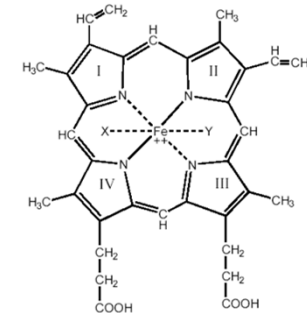


Figure (1) Concentration / Time relationship of IgM of both groups
Effects on the immune system

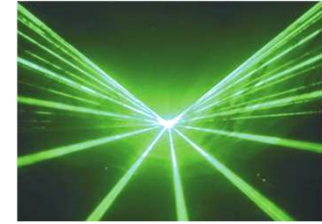
Effects of Green Laser:



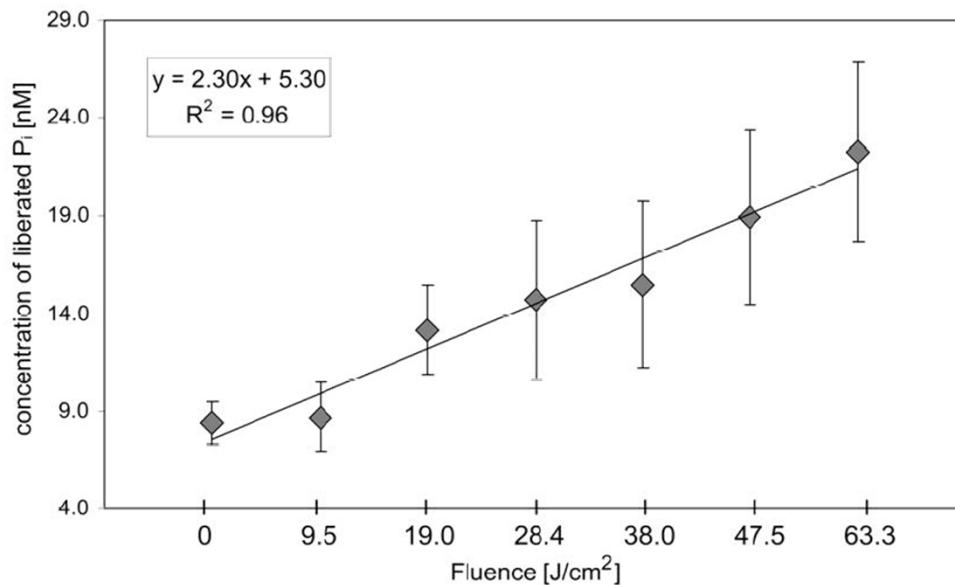
- Green binds to hemoglobin
- Improves the function, behavior and cell elasticity of red blood cells [17, 20, 38, 61]
- Increases Oxygen Delivery [17, 20, 31, 38, 50]
 - improved oxygen affinity
 - increased attraction of oxygen to hemoglobin
 - Improved ability to carry more oxygen
- Decreases in lactic 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:

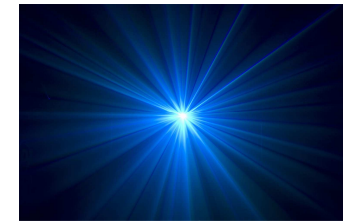


- Kassak et al. (2005): Green laserlight increases the production of ATP in the irradiated mitochondria for more than 30% [23]

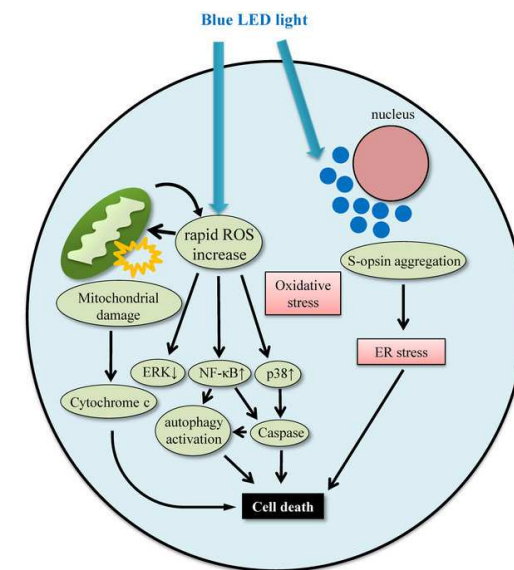


Activity of Na⁺/K⁺-ATPase of red blood cells irradiated with Nd:YAG laser of various fluences. Results are presented as mean ± S.E.M. of the concentration of inorganic phosphate (n=8). Equation of the trend line and coefficient of determination (R²) are shown.

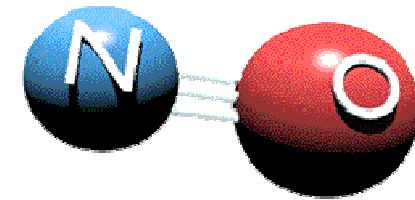
Effects of Blue Laser:



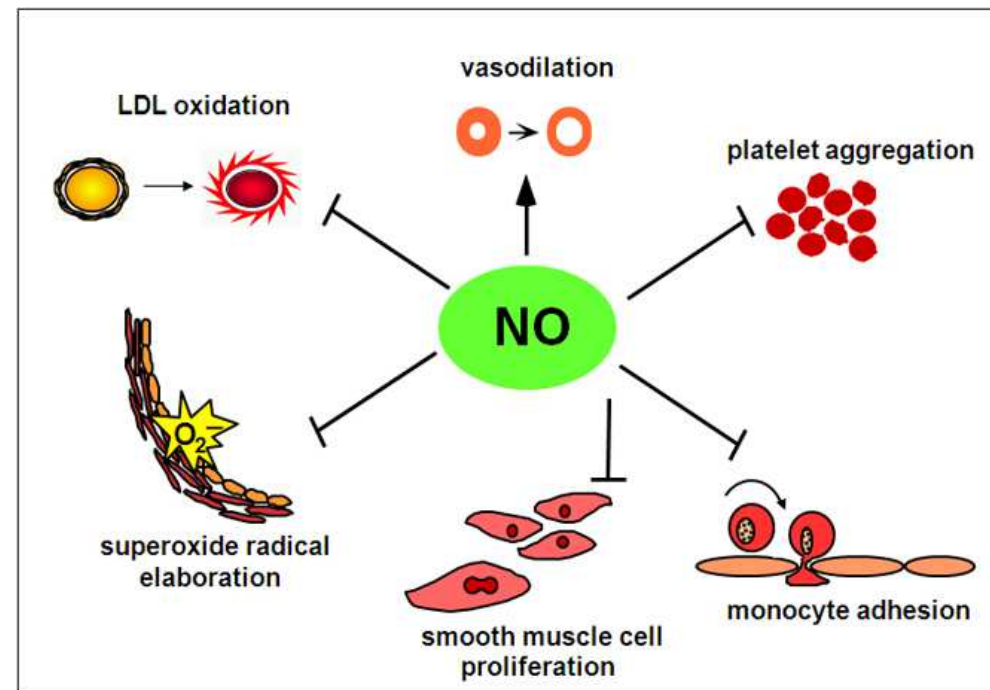
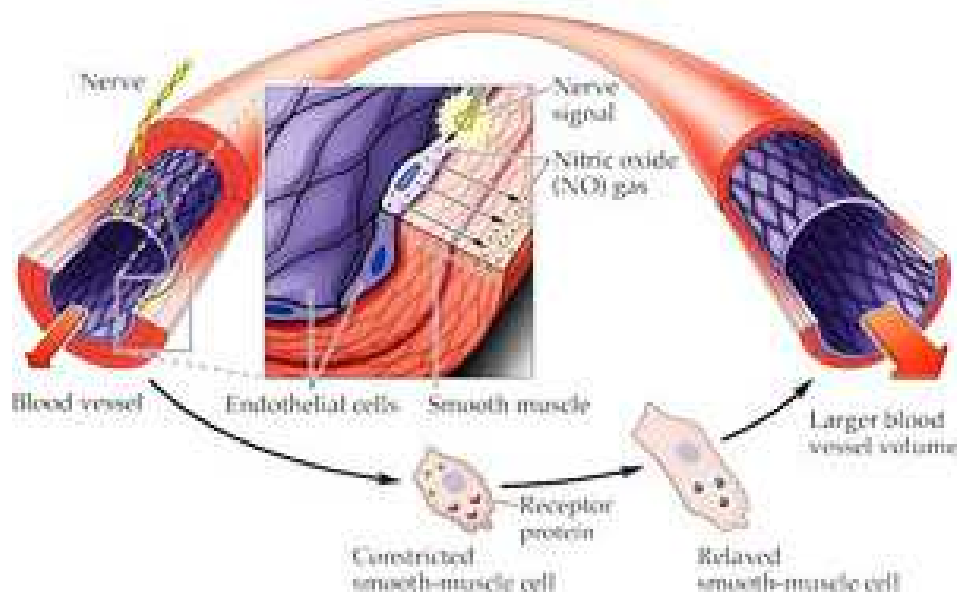
- Blue light **releases nitric oxide (NO) in monocytes with vasodilatation and improvement of endothelial dysfunction** [42]
- NO is known to be a growth, immune, and neuromodulator, as well as a stimulator of stem cell proliferation and it has a critical roles in analgesia, vasodilation and angiogenesis 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:

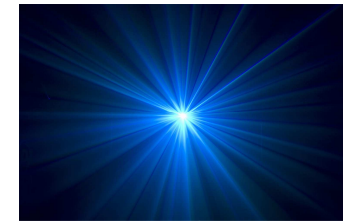


The Science Behind Nitric Oxide





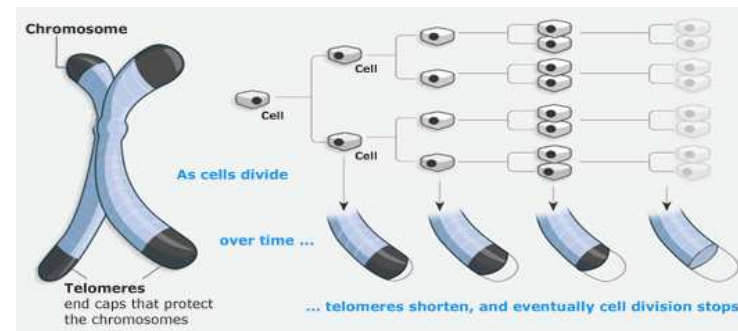
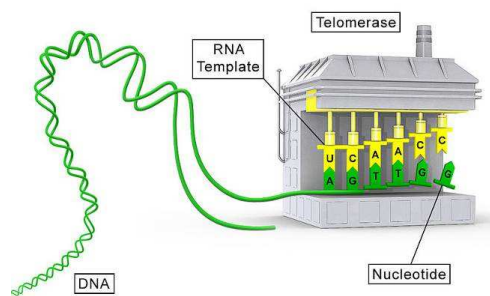
Anti-Aging Effects of Blue Light:



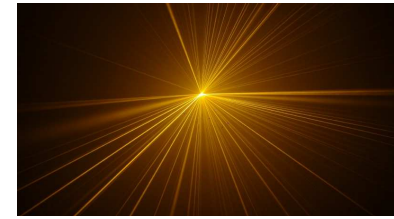
Nitric Oxide Activates Telomerase and Delays Endothelial Cell Senescence

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.



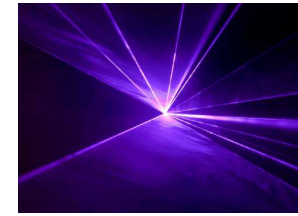
Effects of Yellow Light:



- 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]



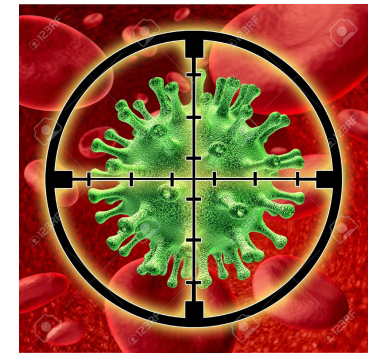
Effects of UV Light:



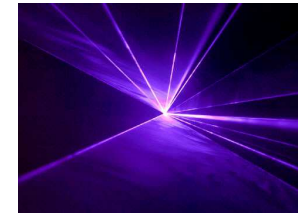
Experience has shown that ultraviolet blood irradiation can strengthen the immune system and improve overall health [39, 40, 41, 46, 47, 49].

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

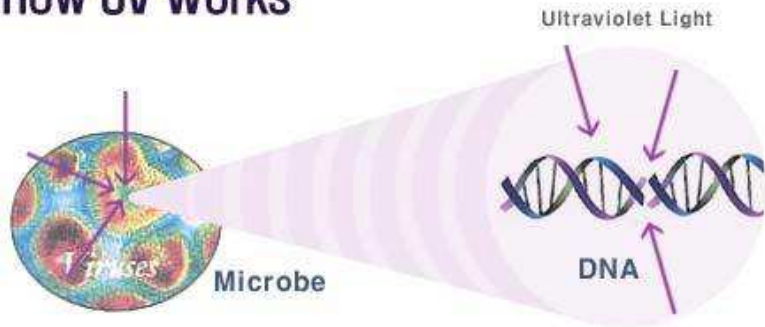
- Increases oxygen absorption into body tissues
- Destroys fungal, viral, and bacterial growth
- Improves circulation and decreases platelet aggregation
- Improves circulation by dilating blood vessels
- Improves the body's ability to detoxify and inactivate or remove toxins
- Activates cortisone-like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



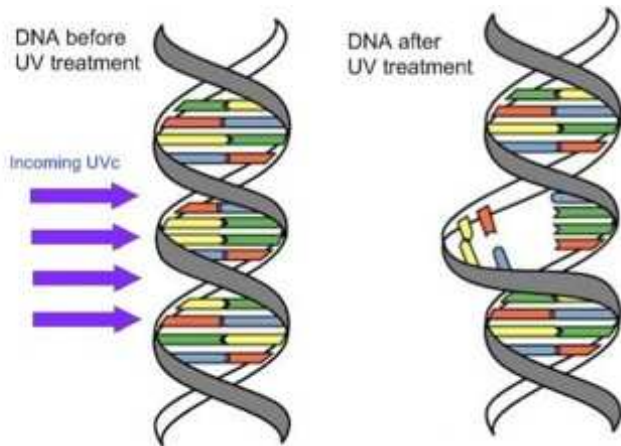
Pathogen Deactivation by UV Light:



How UV Works



The molecular structure of the DNA is broken down rendering the microbe harmless



- 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 toxic 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

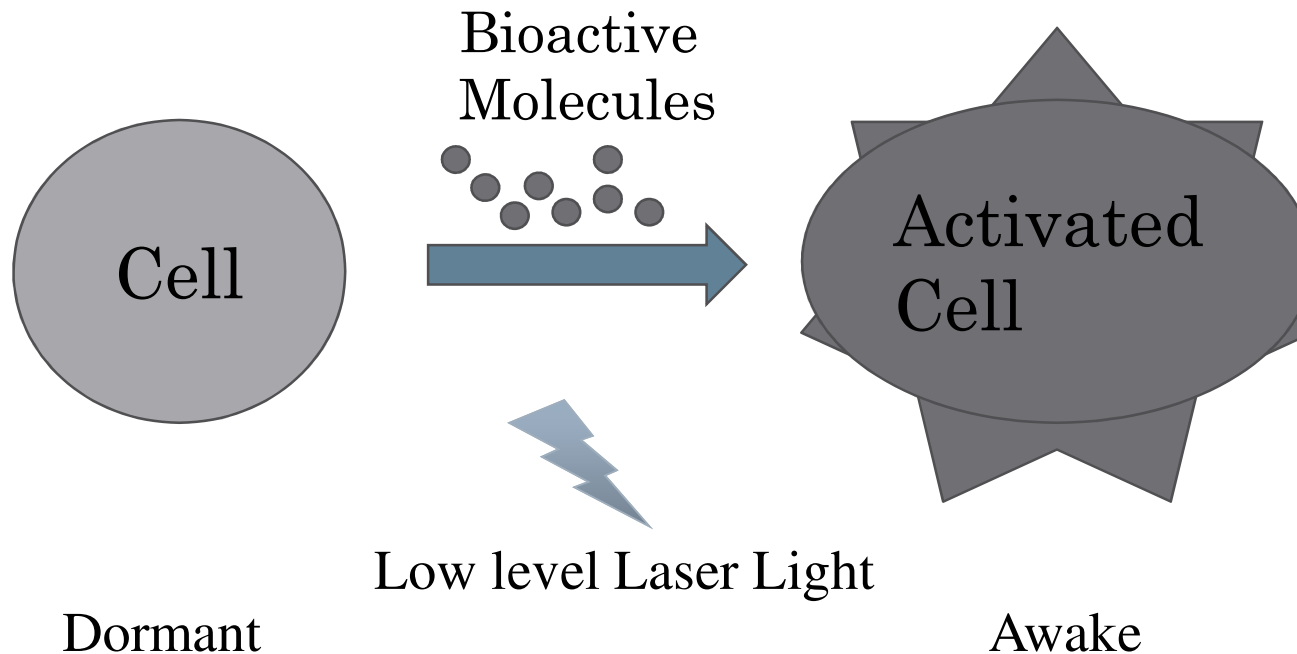


- Boosting cellular energy by increase of ATP synthesis
- Immune System Stimulation
- Improvement of microcirculation and reduction of blood viscosity
- Activation of macrophages
- Positive effects on heart and metabolism
- Improves the function, behavior and cell elasticity of red blood cells
- Increases 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

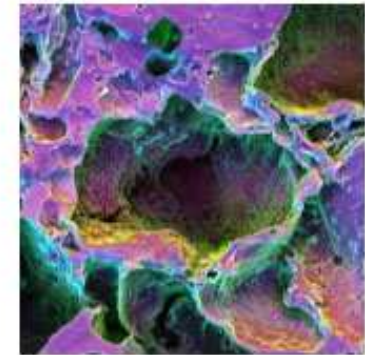
PHOTO ACTIVATION of Stem Cells with Laser



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

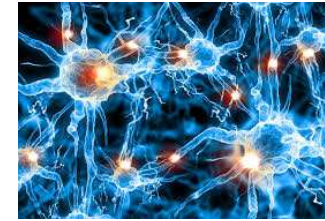
Harvard's groundbreaking new research in the use of lasers to stimulate stem cells to regrow tissue is generating interest and excitement throughout the medical community.

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.



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

PHOTO ACTIVATION of Stem Cells with Laser



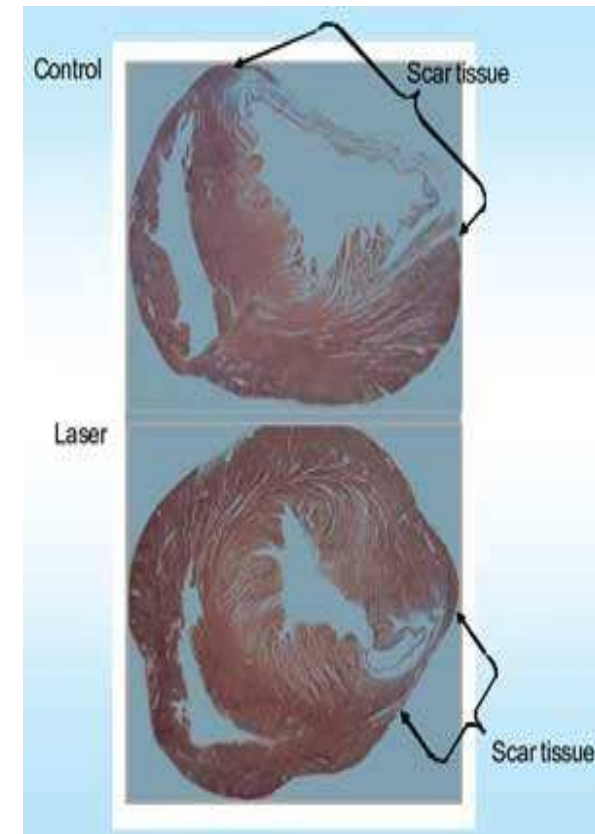
Induction of autologous mesenchymal stem cells in the bone marrow by low-level laser therapy has profound beneficial effects on the infarcted rat heart.

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

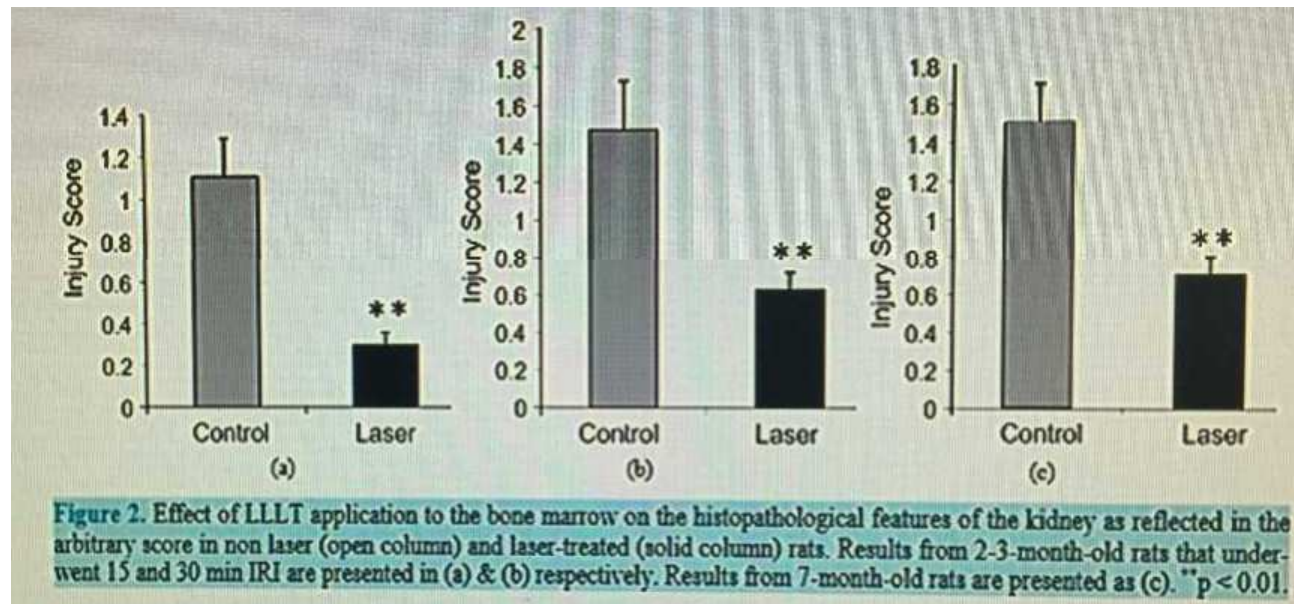
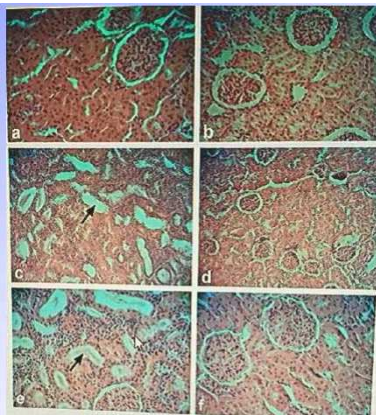


Figure 2. Effect of LLLT application to the bone marrow on the histopathological features of the kidney as reflected in the arbitrary score in non laser (open column) and laser-treated (solid column) rats. Results from 2-3-month-old rats that underwent 15 and 30 min IRI are presented in (a) & (b) respectively.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

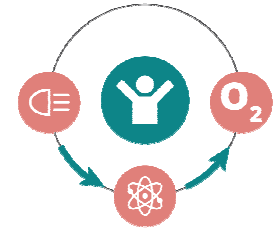


Cells were incubated in patients PRP and or activated with laser for 30 min. Dulbecco's Modified Eagle Medium (DMEM), 10% foetal bovine serum (FBS), 0.1% penicillin/ streptomycin, 1 µg/ml Fungizone. The cultures were incubated at 37°C in an atmosphere of 5% carbon dioxide (CO₂).

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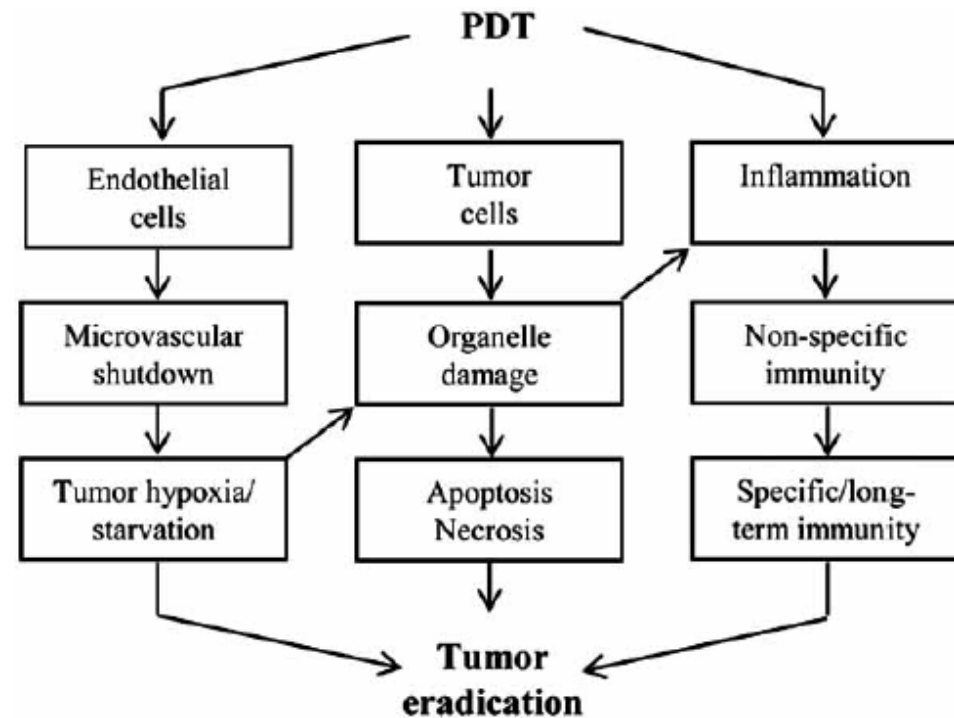
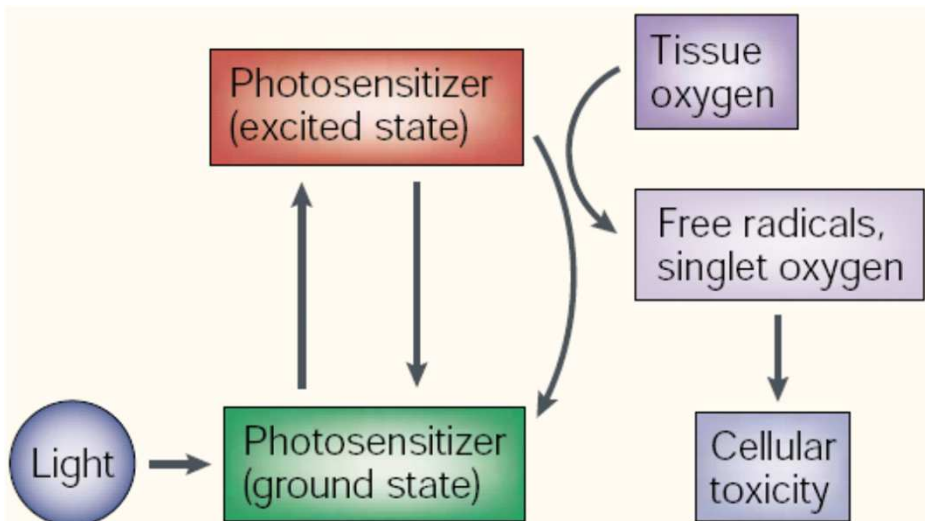
Photodynamic Therapy for Cancer and Infections



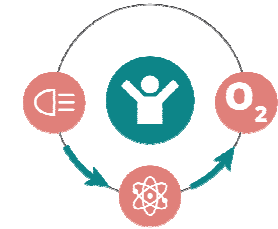
Principle:

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

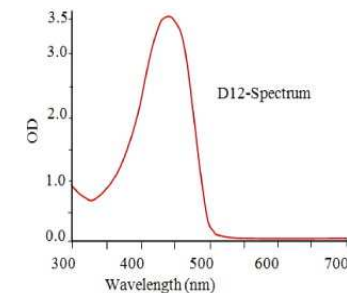
1. Photosensitizing agent
2. Light of specific wavelength



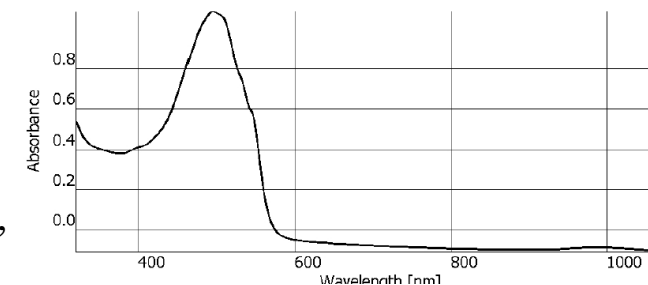
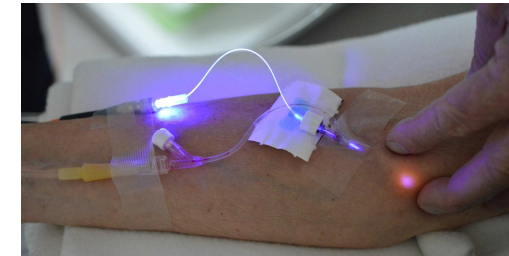
Photodynamic Therapy for Cancer and Infections



- 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



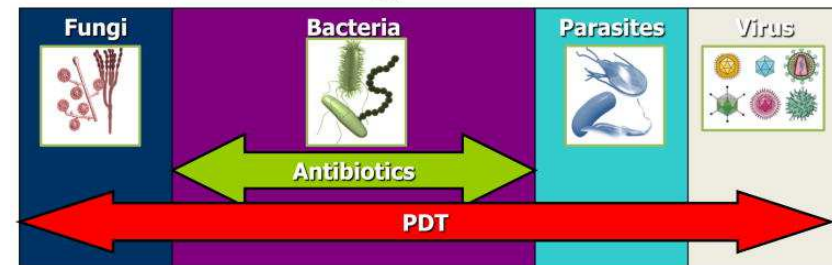
Light Absorption of Doxorubicin

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

Advantages of PDT



Curcumin with 15.000-fold increased bioavailability



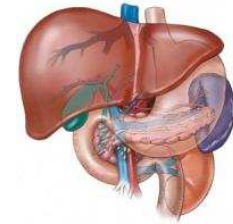
Chlorophyllin and Phycocyanin Complex

Areas of Application:



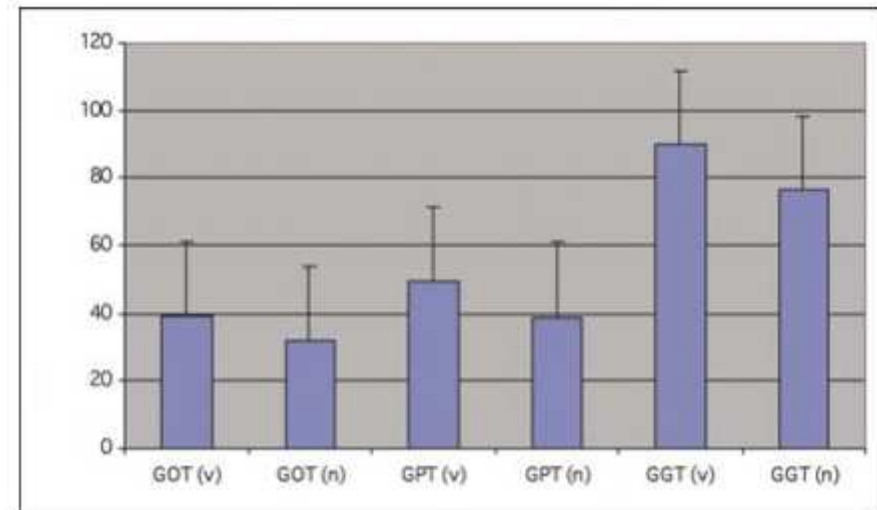
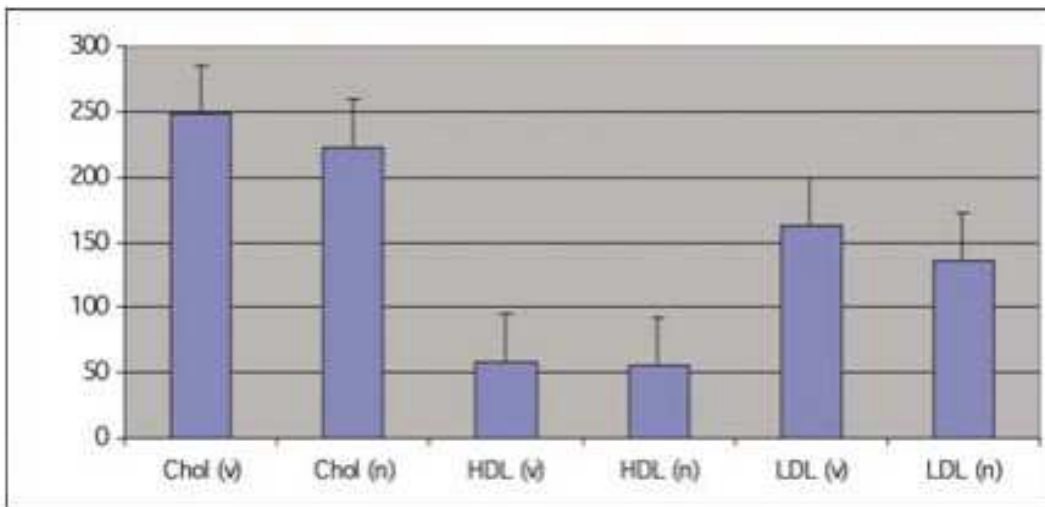
- Internal Diseases (Diabetes, chronic liver and kidney diseases)
- Metabolic disorders
- Cardiovascular diseases
- Chronic pain
- Fibromyalgia and rheumatism
- Allergies
- (Chronic) Inflammation
- Hypertension
- Auto-immune diseases
- Macular degeneration
- Tinnitus
- Multiple Sclerosis
- Depression, 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 photosensitizing agents)

Important Studies (1): Chronic Liver Disease

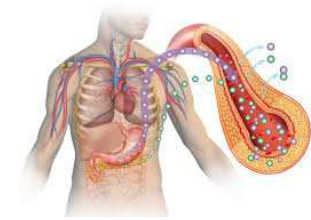


Weber, M./ Fussgänger, T./ Wolf, T. (2010): Intravenous Laser Blood Irradiation: Introduction of a New Therapy:

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

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

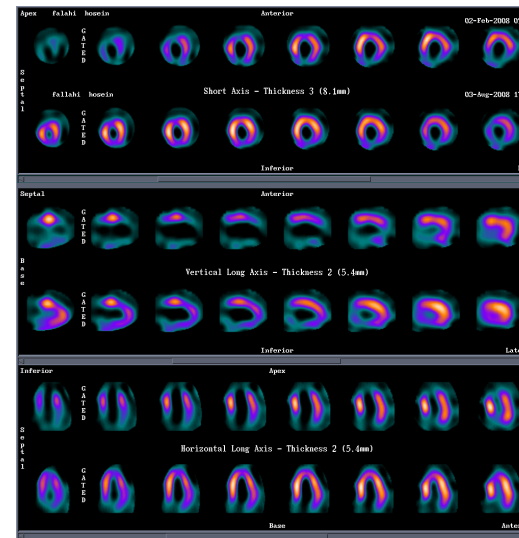
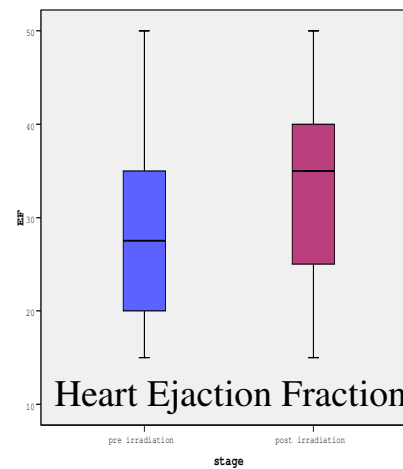
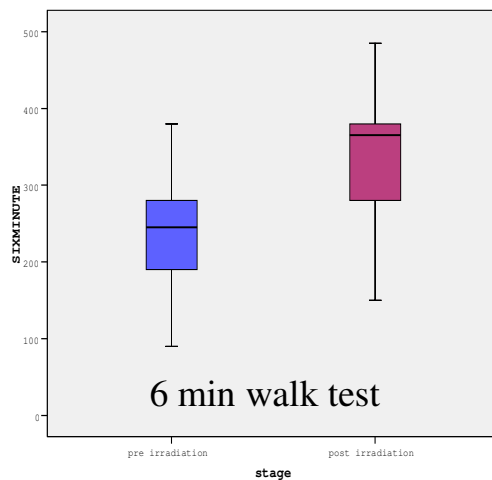


Important Studies (3): Cardiovascular Disease



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



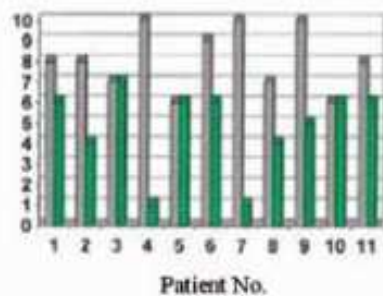
Schumm, N. (2006): Intravenous Laser Therapy: A Pilot Study for Treatment of Multiple Sclerosis

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.

Improvement of the Fatigue Syndrome



Improvement of the Senso-motor disturbances

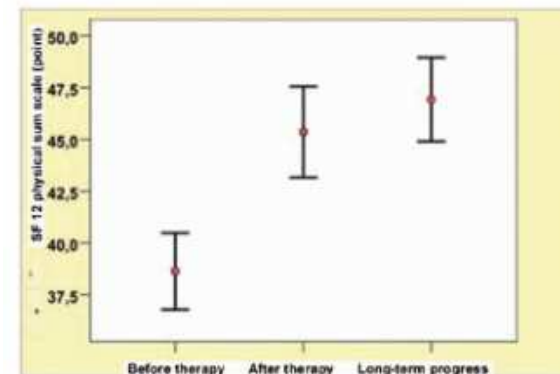
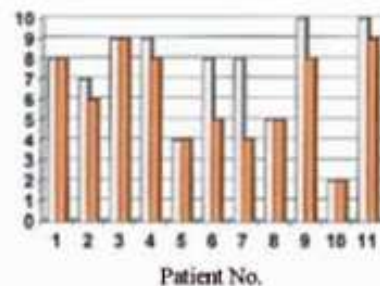
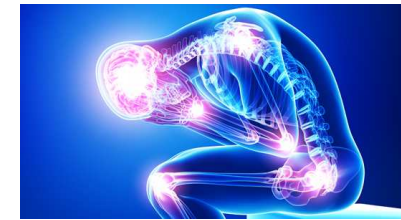


Fig. 3: Physical sum scale before and after the therapy. The mean as well as standard deviation is shown.

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 intravascular 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

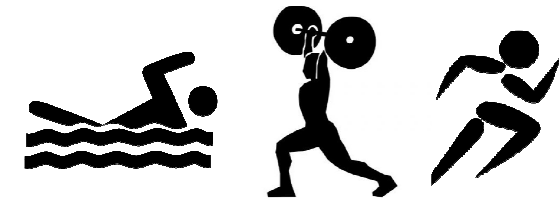
Lymphocyte Transformation Test*: Results in patients with chronic lyme disease

*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).

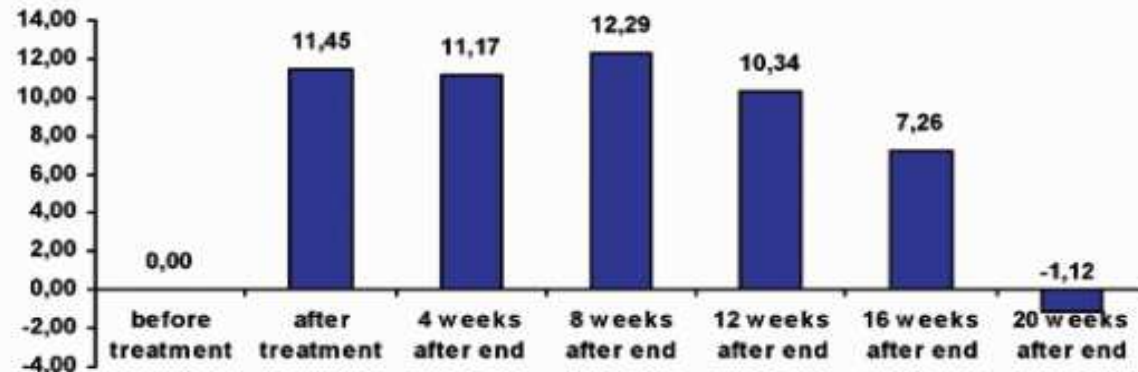
Index >3,0 positiv Index 2,0-3.0 borderline Index <2,0 negativ

	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

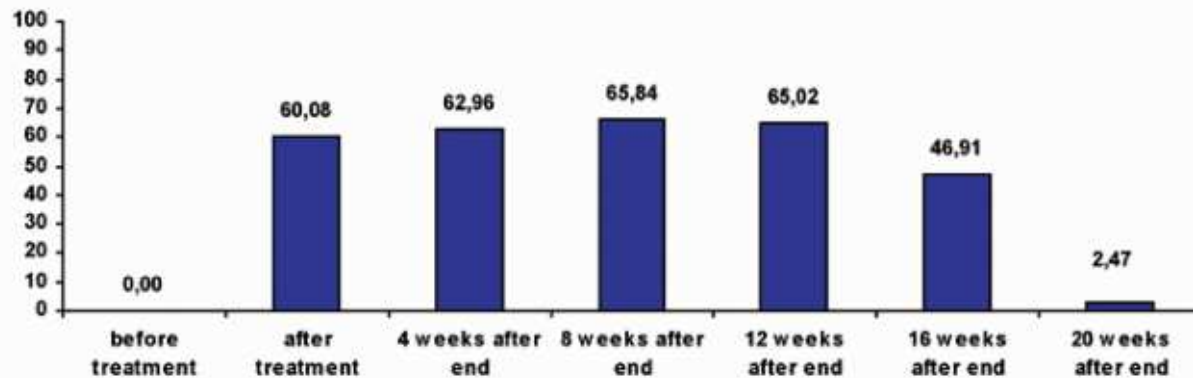
Important Studies (7): Physical Fitness



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

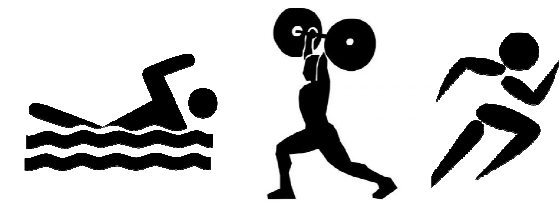


Mean pectoral muscle maximum lifting power percentage variation at any time of measurement



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

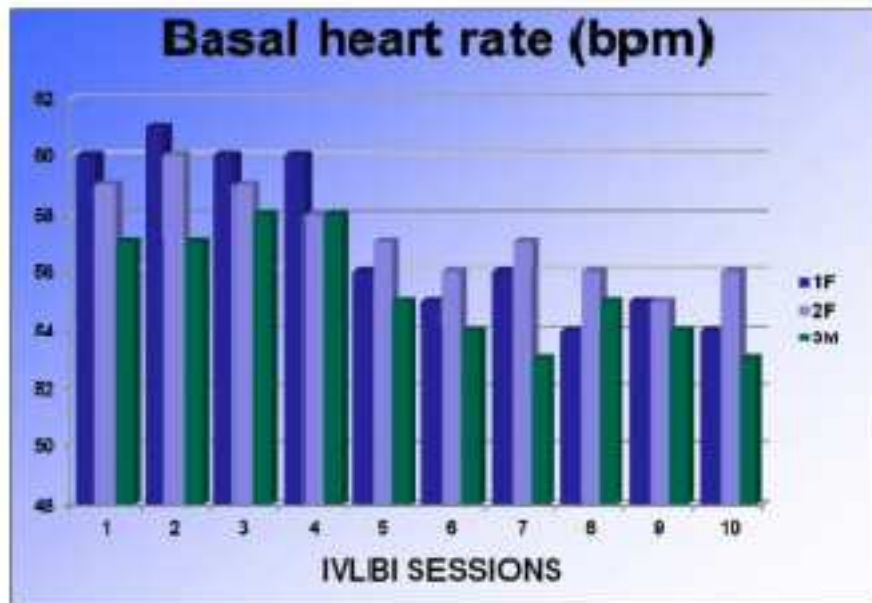


Fig. 49: Reduction of basal heart rate after 10 treatments in 3 athletes (f= female, m=male)

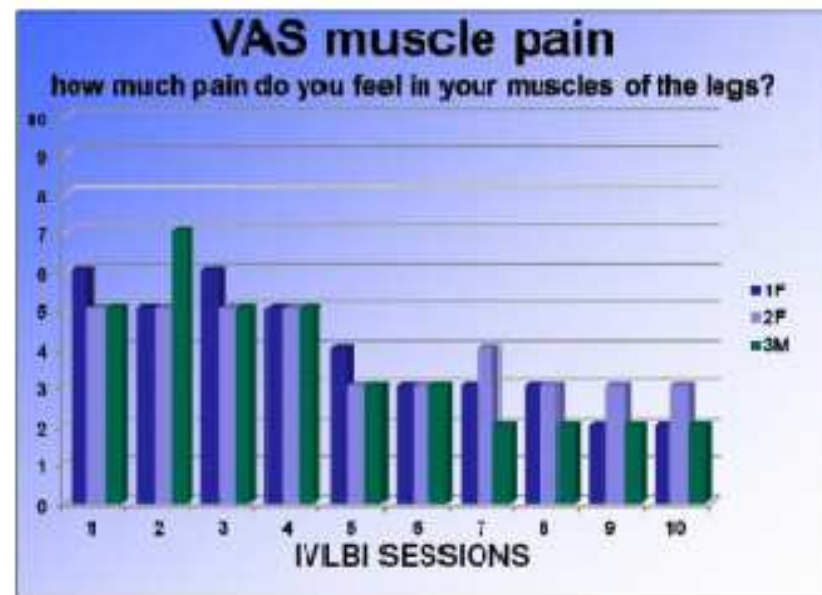


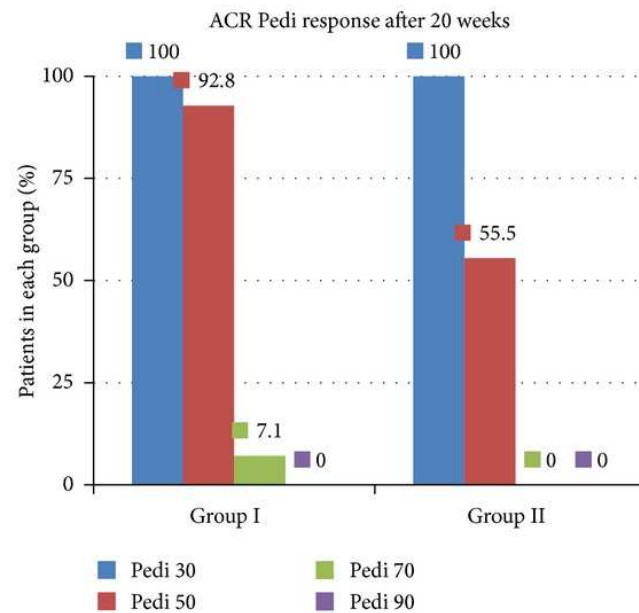
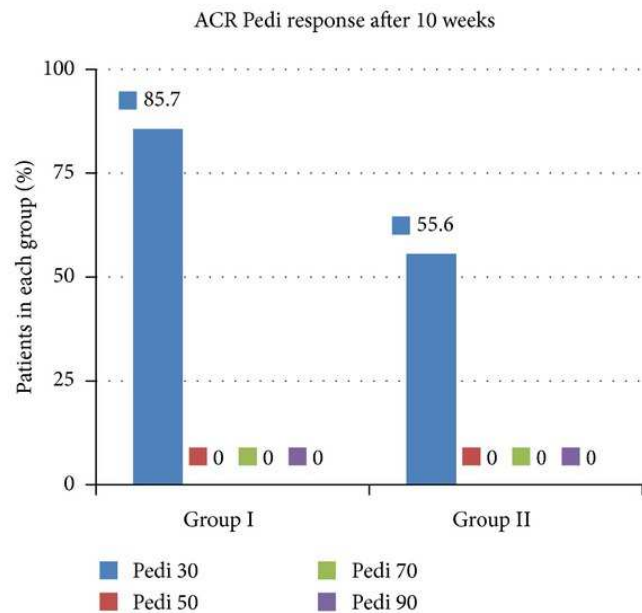
Fig. 52: Reduction of muscle pain after 10 treatments in 3 athletes (f= female, m=male)

Important Studies (8): Juvenile Idiopathic Arthritis

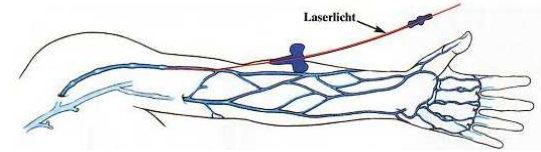


Ailioaie L. et al. (2013): Intravenous Laser Blood Irradiation Increases Efficacy of Etanercept in Selected Subtypes of Juvenile Idiopathic Arthritis - An Innovative Clinical Approach

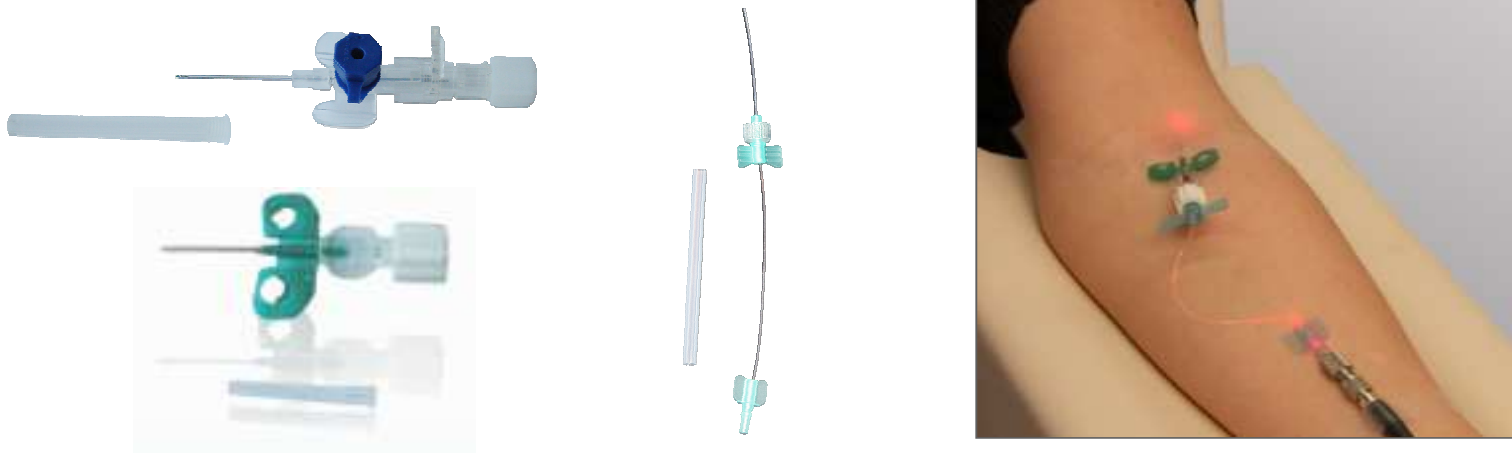
Disease improvement was evaluated using the ACR Pediatric (ACR Pedi) criteria. The ACR Pedi 30 (50, 70, and 90, resp.) criteria are defined as improvement of more than 30% (50%, 70%, and 90%, resp.), in at least 3 of the 6 core set variables used to assess disease activity, with no more than one variable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

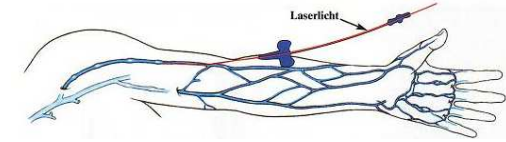


For application of intravenous laser the physician can chose between a standardized 22G canula (blue) or a specific butterfly.

After placing the canula (or butterfly) into the vein the so-called laser catheter 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:



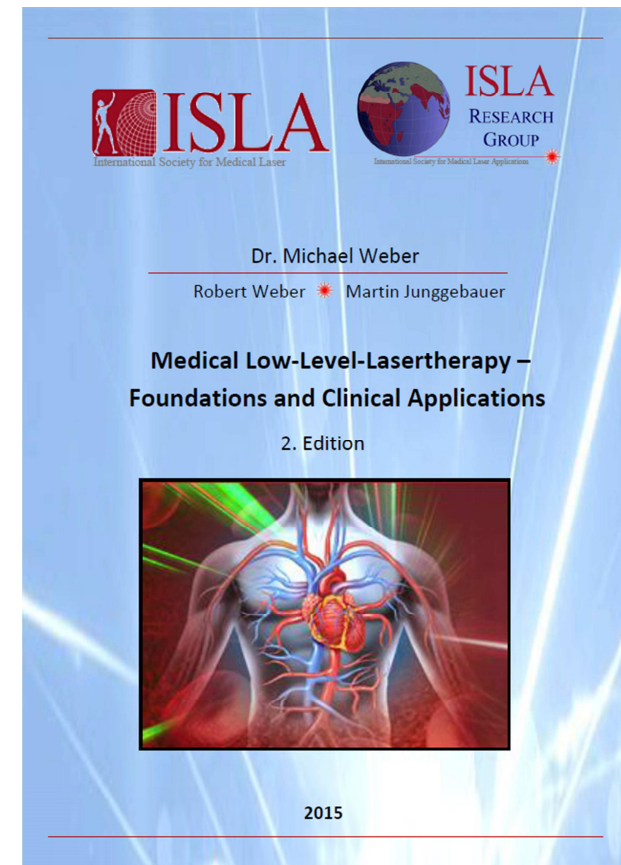
New Development: Y-Canula (3-way canula) for infusion and intravenous laser



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.

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Systemic Regeneration with Low Level Laser Therapy

Dr. Luis Martínez, MD, MPH, DABCL

President

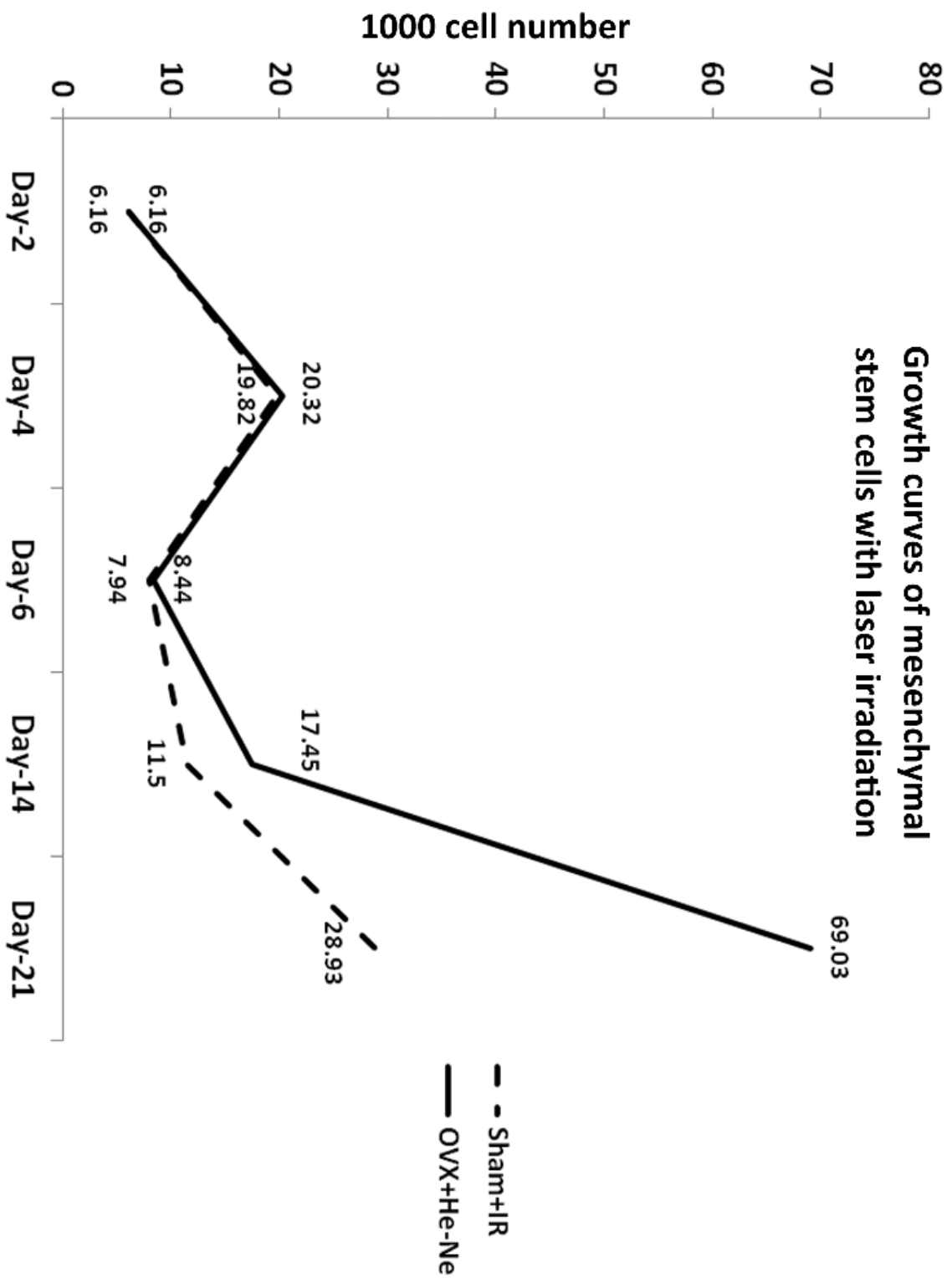
XanoGene Institute

Regenera

ISLA CONGRESS 2017

LLLT and Regeneration

- LLLT has been shown to positively modulate regeneration capacity, inflammation and stem cell function when used adequately.
- In mesenchymal stem cells, LLLT can:
 - Increase proliferation
 - Improve survival
 - Increase growth factor release
 - Improve differentiation capacity
- Increased Bone marrow release of stem cells has been noted with after multiple acute pathologies
- Increase BMSCs may be associated with improved outcomes



Observations

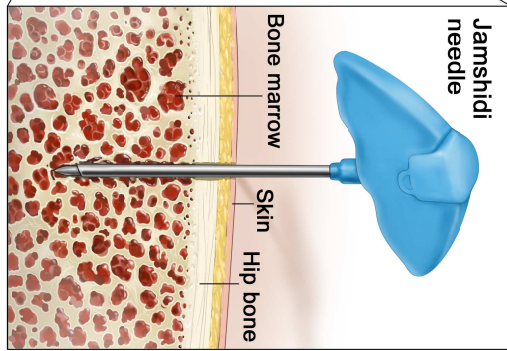
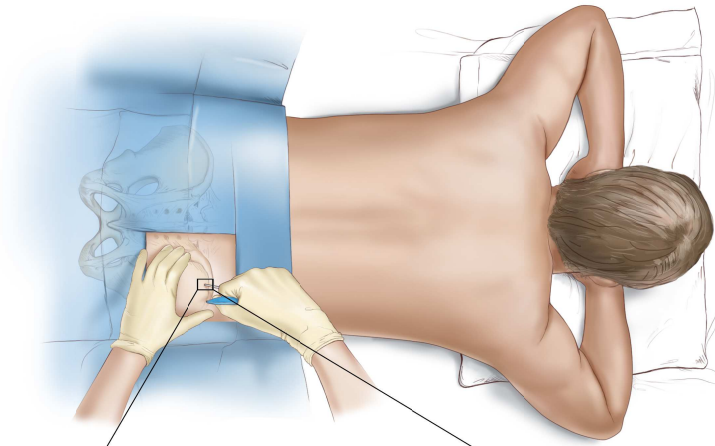
- Direct bone marrow irradiation shown in animal studies to increase BMSC circulation and improve outcomes (Oron et al.)
- Technically simple procedure, already done extensively for BM aspiration and cell concentrate
- Should increase circulating stem cells and improve function

The Martínez Bone Marrow Laser Irradiation Procedure

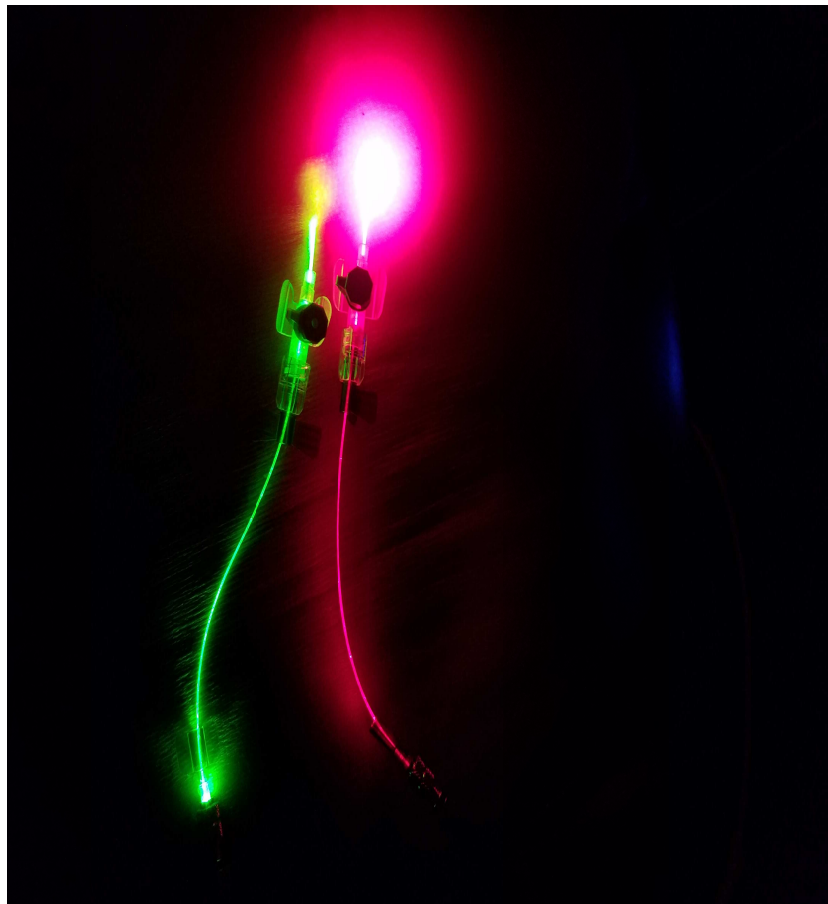
- Novel regenerative procedure developed by Dr. Luis Martinez, Puerto Rico
- Office based
- Similar setup to a posterior superior iliac crest bone marrow aspiration
- Specific parameters (duration, power, wavelength) based on clinical observations

Goals:

- To increase systemic circulation of BMSCs
- Possible role in mitochondrial modulation of this stem cell population



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Direct Bone Marrow irradiation vs IV irradiation

- Bone marrow space contains confined stem cell population
- Direct treatment to precursors vs trying to reverse affected cells (IV)
- IV of course much easier procedure suitable for repeat treatments

Follow up experience

- 10 patient follow up on the Martínez Bone Marrow Laser Irradiation Procedure
- **74% average increase in CD34+ Stem cells, 2 hours post treatment, as measured by flow cytometry**
- Additional antiinflammatory and analgesic response when added to standard treatment

Notable case

- 67 y/o female patient with Grade 3 OA in right hip
- Chronic 9/10 pain on most days
- Unable to exercise and limited walking
- Treated with ultrasound guided BMC injection plus contralateral Martínez Bone Marrow Laser Irradiation procedure

Results:

- At 2 months post treatment, pain completely gone
- Patient started light exercise, jogging 2 x per week
- Pending follow up imaging
- Interestingly, follow up labs also showed improvement in renal function (systemic benefits)

Conclusions

- Systemic/ multi organ regeneration has been shown to occur by irradiating bone marrow with LLLT
- The Martínez Bone Marrow Laser Irradiation Procedure was developed as a next step, more invasive approach to achieving bone marrow cell irradiation
- Data and clinical applications have so far shown significant increases in circulating stem cells
- Patient improvement has been shown post procedure

Summary

- The Martínez Bone Marrow Laser Irradiation Procedure has been shown to be safe and effective as part of a regimen aiming to stimulate systemic regeneration.
- Should be included as part of the physician armamentarium when applying LLLT for regenerative purposes.
- Ongoing clinical experience as well as research will help elucidate additional parameters (duration times, wavelengths etc.)

Thank you!