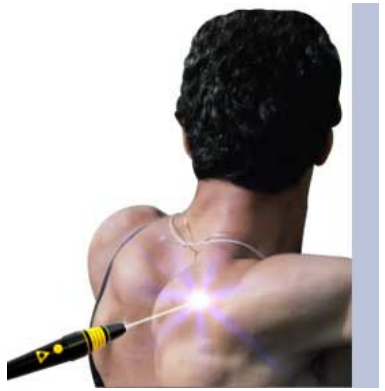
Impulse Dioden Laser (Acupuncture) Therapie

Effective biophysical treatment for humans and animals

Photobioactivation - Light is energy of life

Beneficial Effects:

- **Photochemical effect**
- **Regenerative effect**
- **Analgetic effect**
- **Anti-inflammatory effect**
- **Immune system modulation effect**



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Wound healing (formation of granulation tissue, improves microcirculation +neovascularization)

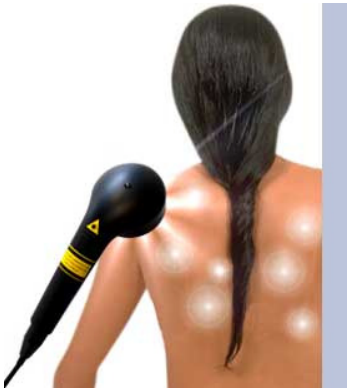
Anti-inflammatory effect (enhancement of immune response, enhances lymphatic activity, reduces swelling (oedema & haematoma resorption))

Analgesia (Induces B-endorphin release, Increases ATP production, Increases the measurable potential on nerve cell membranes, Relaxation of muscle tension and increase of pressure pain threshold, Reduction of trigger activity (f.e. myofacial pain and fibromyalgia)

Acupuncture point activation

- **Neurophysiologic effects** Reflex action within seconds,
- **Neurochemical effects** Stimulation of various neurotransmitters and endorphins
- **Cybernetic effects** Recovery of regulatory mechanisms

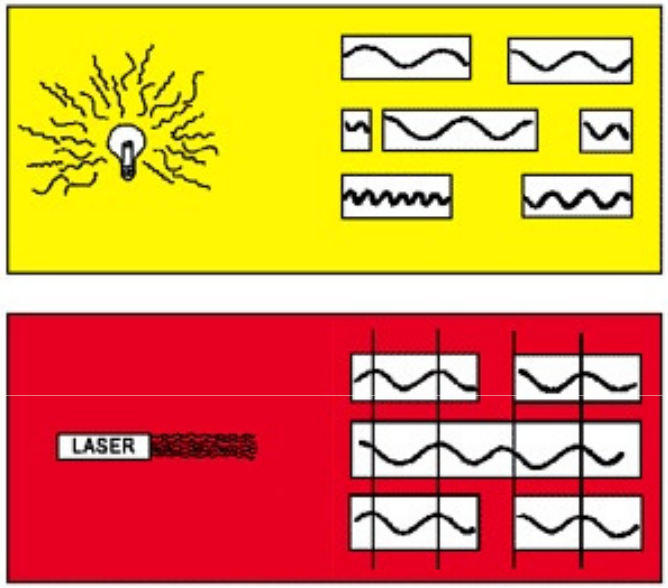
Improvement of regenerative processes (Stimulates the rate of mitosis in repair mechanisms (bone, epithel and muscle tissue, Enhances peripheral nerve regeneration after injury, Reduces degenerative process on central nervous system, Reduces or eliminates scar tissue formation, Increases collagen synthesis (fibroblast proliferation, tensile strength and elasticity increase)



Laser Therapie in Veterinary Medicine

Today, LASER stands for: Light Amplification by Stimulated Emission of Radiation

<u>The white light</u> as emitted by normal bulbs or daylight (sun) is a mixture of all wavelengths



<u>Laser – light :</u>

- Monochromaticity: only one precise wavelength
- Coherence/Polarization: all the light waves are of the same phase, ordered and optimised
- Parallelism: emitted into one direction in a parallel way

Areas of laser application

- simple laser pointer
- soft-lasers for use in cosmetics,
- high-power industrial lasers,
- gas lasers such as the carbon dioxide laser (35 kW) for cutting.

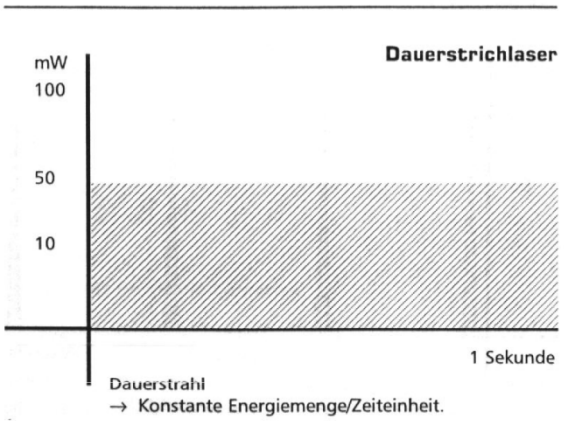
Modern diode lasers for example, find everyday uses in laser printing, CD-players, CD-ROM drives, bar-code scanners and in optical fibre phone lines, in which the signals are actually transmitted by laser.

Lasers in medicine

- **surgical lasers**
- **Therapy and acupuncture lasers**

Low level laser therapy (LLLT), so-called "Mid-lasers“ or so-called therapeutic lasers.

These devices **basically work with wavelengths in the infra-red spectrum (600-900 nm).**



• **Continuous beam lasers**,

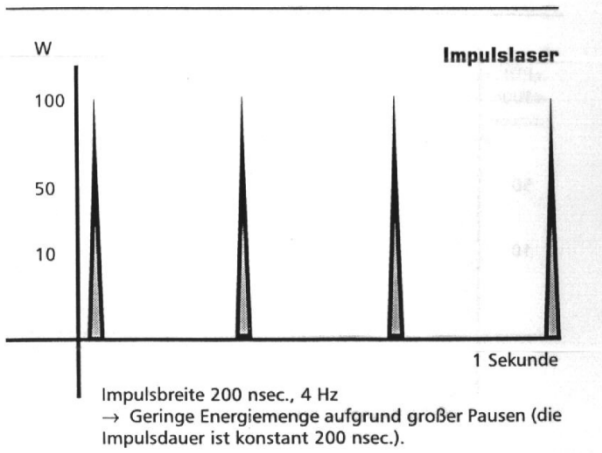
which continually emit laser light (600 – 800nm).

The output of these devices lies in mW - area.

• **Impulse Dioden Laser**

light pulses of very high intensity (peak pulse power in watt - area) but very short duration (200 nsec) wavelength(900 nm)

tissue penetration much higher, **the short duration of the light beams means that no thermal or even coagulatory effects occur in tissues**.



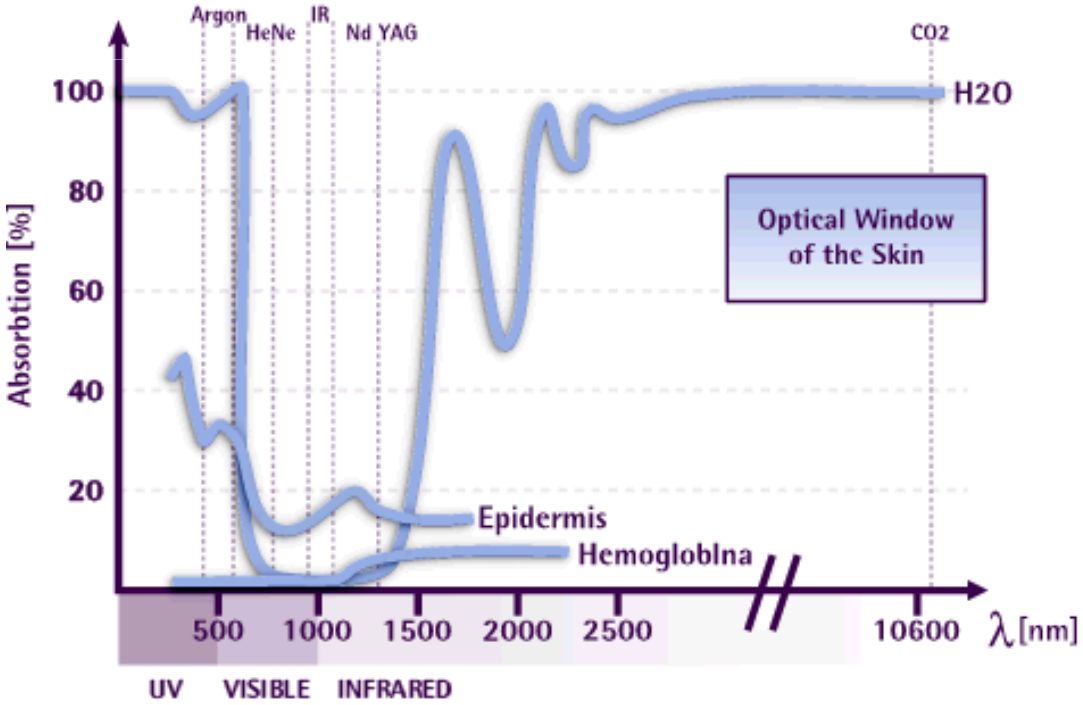
Red Light (600 – 700 nm)

Readily absorbed by the mitochondria and therefore potentially stimulatory
Excellent source of stimulation of a range of growth factors
Red Light **does not penetrate** very effectively below the skin surface and into the tissue below
Red light is the best for wound healing or superficial conditions but is not the most effective way to treat deeper injury.

Infrared (Invisible) (870 – 1300 nm)

More penetrative through the tissue, especially the 900nm range, therefore this range is selected for treatment through intact skin and pain relief **also in deeper layers.**

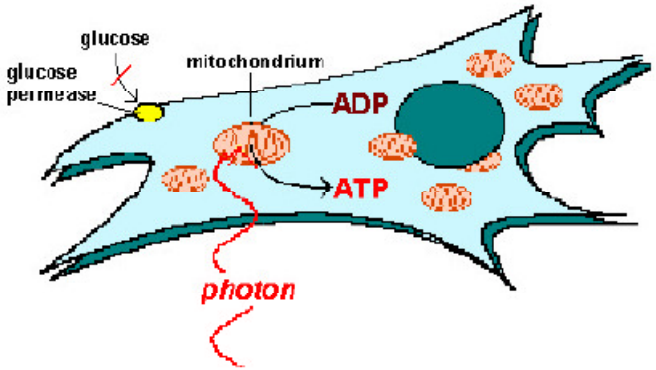
Absorbed by the mitochondria and therefore potentially stimulatory.



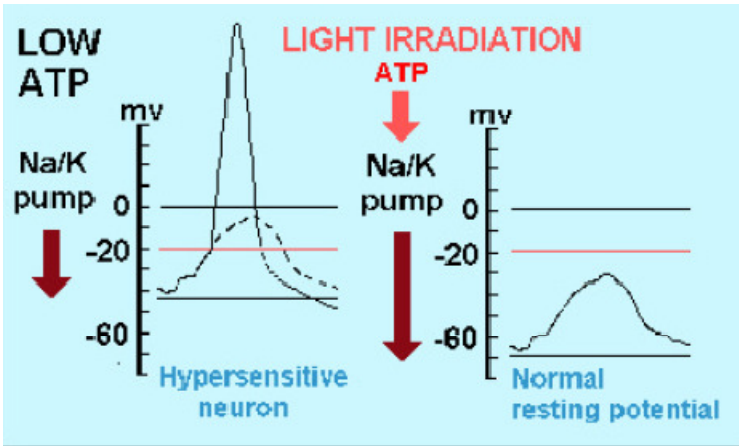
Optical window of the skin

The skin is a non-homogenous tissue and yet shows in its spectral analysis an optical window with an optimal transmission capability of light between >600 nm (visible red) and <1300 nm (infrared). Wavelengths (colors) outside of this optical window are mostly being absorbed before they reach deeper layers.

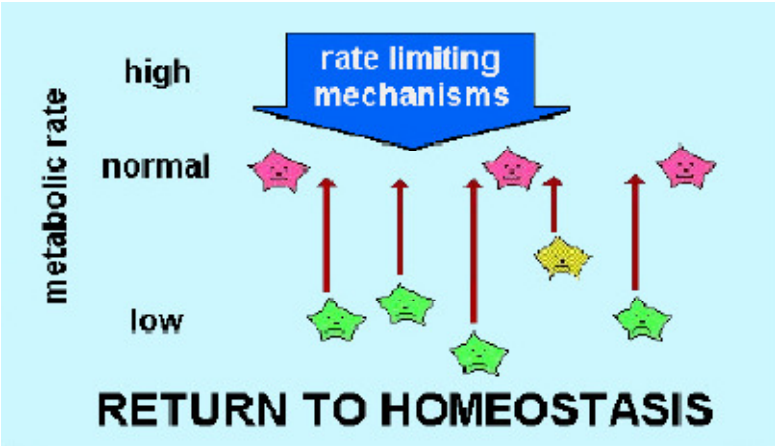
Laser Biostimulation:
Physiological basis of laser effects
Accoording to exploratory studies of the infra-red laser approx. 70% of the laser energy is reflected from the skin surface, 15-20% of the entrant energy is dissipated and lost by diffusion in the body tissues. **Thus only 5-10% of the laser energy is absorbed**. Absorption is by means of a **so-called "antenna pigment"**, the flavoprotein-metal-redox system, which forms an important link in the **respiratory chain within the mitochondria**. Here, absorbed laser photons are transformed directly into cellular energy. **This is particularly beneficial for unhealthy cells and cells in tissue modified by illness, which have a particularly high energy requirement to perform their functions.**



Laserlight drives the synthesis
of ADP -> ATP in mitochondria of fibroblast.

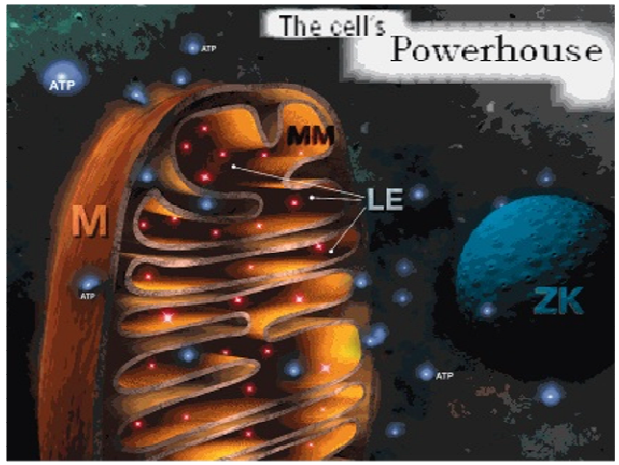


Increased ATP available from laserlight irradiation activates the Na-K pump in hypersensitive neuron to return to normal resting potential.

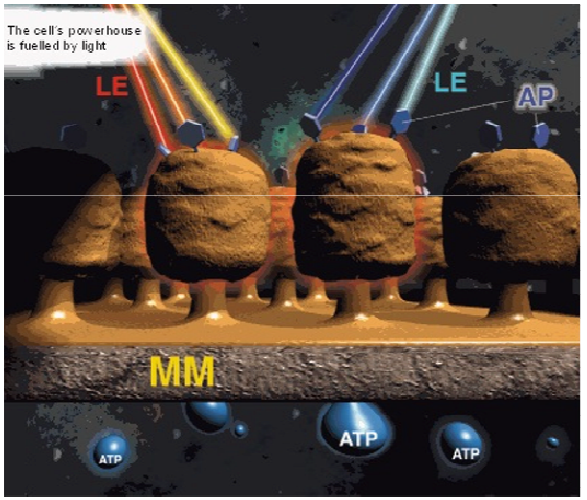


Laserlight augments the metabolic rate of cells with compromised metabolism, normal cells are not affected.

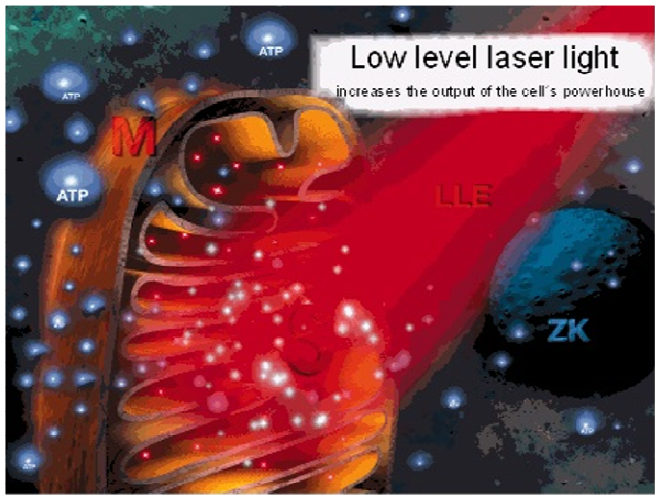
Photobioactivation - Light is energy of life



<-Fuelled by light energy (LE), the cell`s powerhouse - the mitochondrion (M) generates the main source of cellular energy: ATP



Light energy (LE) irradiating the inner mitochondrial membrane (MM) is absorbed by AP=antennae pigments and utilized for the synthesis of ATP ->



<- Representation of the immediate stimulative effect in mitochondria towards LLE = laser light energy irradiating the cell from outside.

Lasertreatment with Energy - Dose

Modern Impulse Dioden Lasers
are having today an output from 100 – 150 Watt.
The Pen with single diode will need than about
10 – 20 seconds to apply 1 Joule per point.
The Lasershower with multiple diods will need about 20 – 30 seconds to apply 1 Joule per point.

Recommended anti-inflammatory dosage for Low Level Laser Therapy

Laser classes 3 or 3B, 904 nm GaAs Lasers (Peak pulse output more than 1 Watt)

Energy dose delivered to the skin over the target tendon or synovia

Diagnoses

Tendinopathies	**Points or cm2**	**Joules 904nm**	**Notes**
Carpal-tunnel	2-3	4	Minimum 2 Joules per point
Lateral epicondylitis	1-2	1	Maximum 100mW/cm2
Biceps humeri cap.long.	1-2	2	
Supraspinatus	2-3	3	Minimum 2 Joules per point
Infraspinatus	2-3	3	Minimum 2 Joules per point
Trochanter major	2-3	2	
Patellartendon	2-3	2	
Tract. Iliotibialis	2-3	2	Maximum 100mW/cm2
Achilles tendon	2-3	2	Maximum 100mW/cm2
Plantar fasciitis	2-3	3	Minimum 2 Joules per point
Arthritis	**Points or cm2**	**Joules 904nm**	
Finger PIP or MCP	1-2	2	
Wrist	2-3	3	
Humeroradial joint	1-2	2	
Elbow	2-3	3	
Glenohumeral joint	2-3	6	Minimum 2 Joules per point
Acromioclavicular	1-2	2	
Temporomandibular	1-2	2	
Cervical spine	2-3	6	Minimum 2 Joules per point
Lumbar spine	2-3	10	Minimum 4 Joules per point
Hip	2-3	10	Minimum 4 Joules per point
Knee anteromedial	2-4	6	Minmum 2 Joules per point
Ankle	2-4	6	

Daily treatment for 2 weeks or treatment every other day for 3-4 weeks is recommended