EFFECTS OF *LOW-LEVEL-LASER-THERAPY* ON CELLULAR METABOLISM AND MITOCHONDRIAL FUNCTION

Dr. med. Michael Weber

TCM and (**Laser**) Acupuncture

Mitochondrial Medicine

www.aureolus.eu

www.tcm-lasertherapy.de

LLLT

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- **Low level laser therapy**
- Low reactive-level laser therapy
- Low intensity laser therapy
- Low level light therapy
- Low energy laser irradiation
- **Photobiomodulation**
- Photobiostimulation
- Biomodulation
- Biostimulation
- Cold laser
- Soft laser
- Laser therapy
- Phototherapy
- Cold Laser Therapy

History of LLLT

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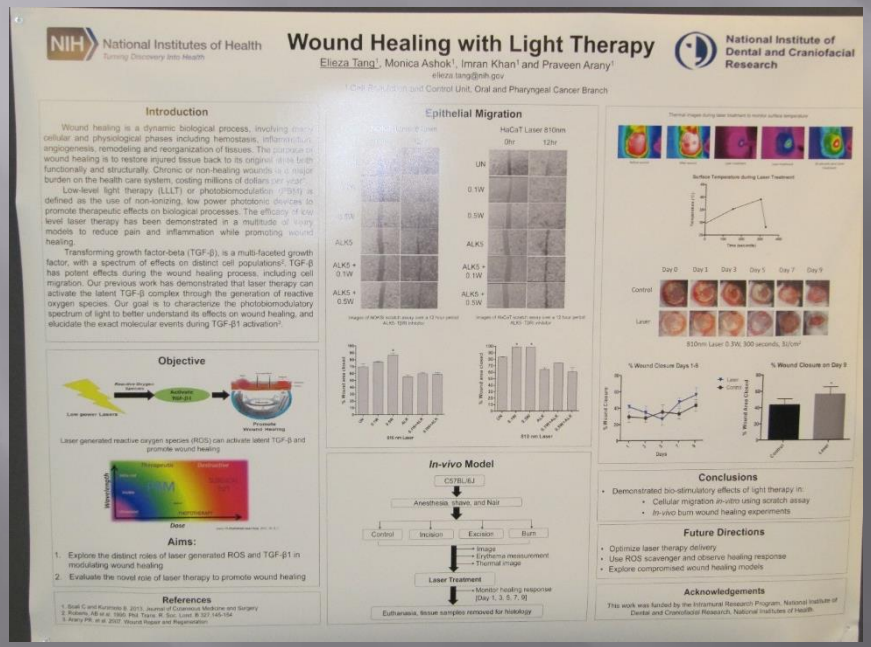
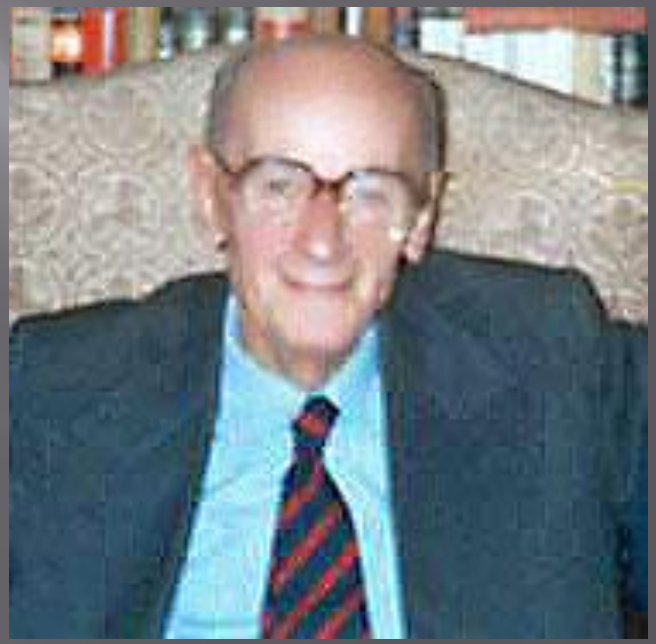
WALT – CONFERENCE WASHINGTON D.C.

PROF. DR ENDRE MESTER, M.D.





Effect of laser on hair Growth of mice (in Hungarian).
Mester, E. Szende, B. and Tota, J.G. (1967). Kiserl Orvostud 19. 628-631

LLLT in Wound Healing

Minimum dose 0,5 – 1 joule ⊕	Maximum dose 8 joules ⊕⊕⊕⊕
Acupuncture point • ear • children • superficially in the skin	Acupuncture point • body • adults • deep in the skin
Skin: white, pale, normal moist, little hair	Skin: dark, pigmentetd, oily, very hairy
Tissue type • mucous membranes < epidermis • inflamed skin or open wounds	Tissue type • nerves < muscles < bones • scarred skin or wound periphery
Initial treatment	Follow-up treatment
Perpendicular radiation	Irradiation of curved areas (joints)
Pain or irritation in surface skin areas	Pain in deep body areas (up to 10 joules)
Chronic conditions	Acute conditions

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LLLT (Biostimulatory effects)

LLLT:

- Microcirculation ↑
- Macrocirculation ↑
- Lymphatic drainage ↑
- Antibacterial
- Antiviral
- Antifungal
- Pain reduction (esp. pulsed; HPLT, interstitial)
- Pruritus ↓
- Local nutrition ↑
- Treatment of specific acupuncture points

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Iranian European Laser Association

For the first time in Iran

Prof. Dr. Frank Bahr

Prof. Dr. Michael Hans Weber

Prof. Dr. Michael Weber

18-20 January 2018

Iranian European Therapeutic Laser Association

International Society of Medical Laser Application

European Laser Academy

Low Level Laser

Blood Laser Therapy

Resonance Therapy and Diagnosis

LLLT in AF

Mitochondrial Medicine in Heart Disease

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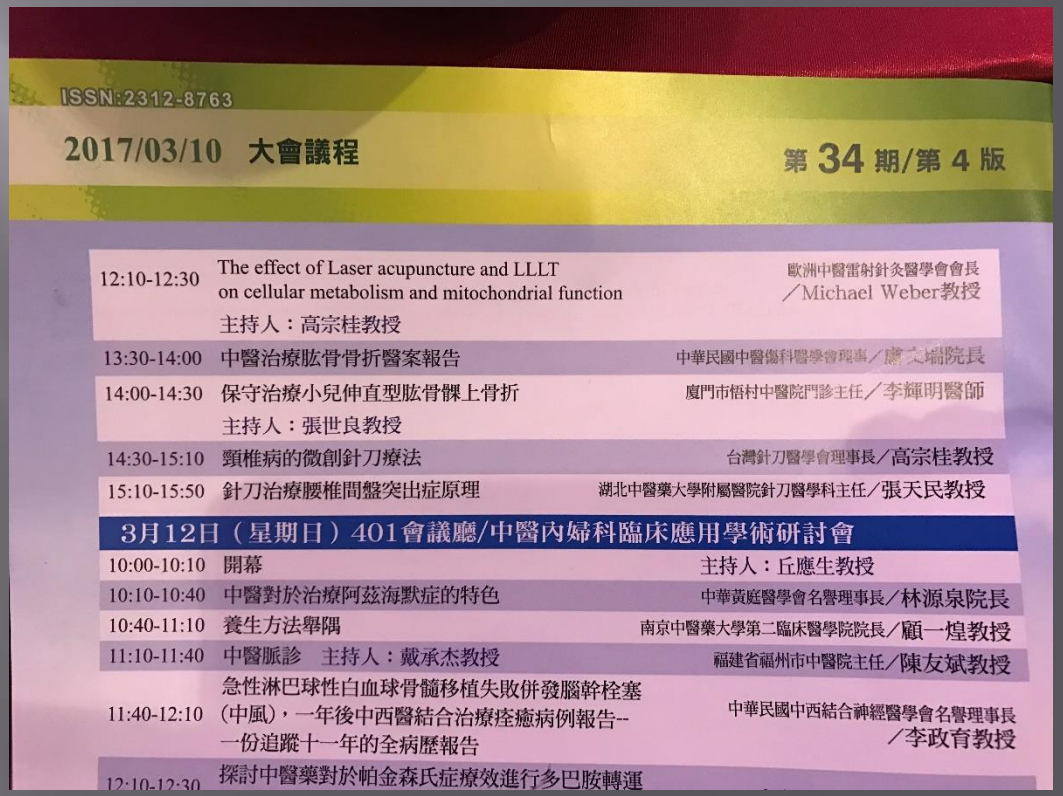
LLLT in China



ISLA BANGKOK 2017

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MitoMed

TARGETING MITOCHONDRIA 2017

- **Home**
- Final Agenda
- Mitochondria Pictures 2017
- Keep me Informed
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WORLD MITOCHONDRIA SOCIETY

Come & join the Key Leaders Opinion around the Network Session of Targeting Mitochondria

Targeting Mitochondria Network Session is a place created for every actors in Targeting Mitochondria chain. Industrials and academics from all countries and specialties come to listen and learn more about Mitochondria, Oxidative Stress and all related subjects. It is a perfect moment to meet people who can bring you **new opportunities**, or help you to solve a problem. You can get in touch with high quality scientists but also industrial managers as well from Marketing or R&D department.

Among the participants of Targeting Mitochondria 2017 *(list updated on October 13)*:

READ MORE...

Targeting Mitochondria World Congress Agenda

NEWS

Targeting Mitochondria Dinner will be organized at Steigenberger Hotel Berlin

Join us for Targeting Mitochondria Dinner which will be held on Monday, October 23 at 20:30. This dinner will gather speakers and attendees. The chef

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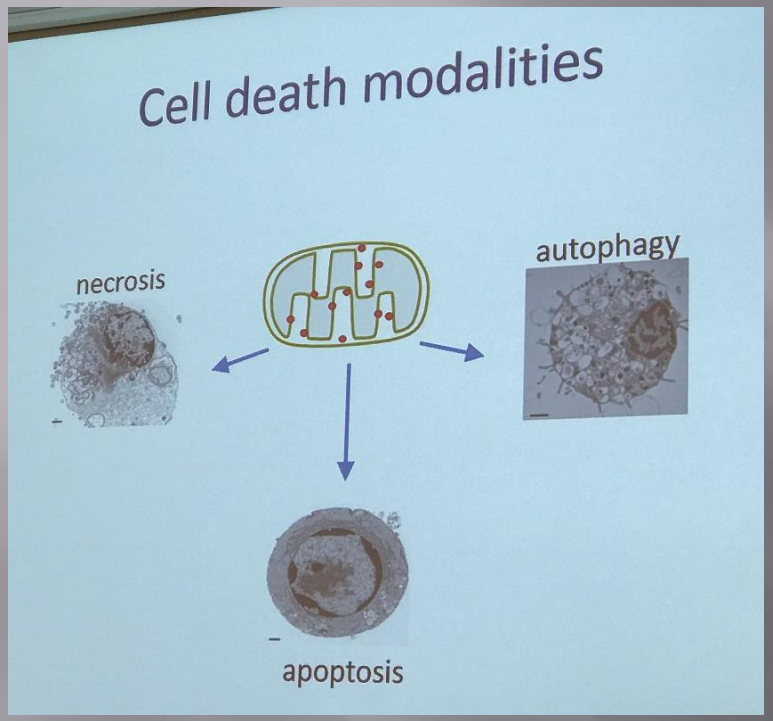
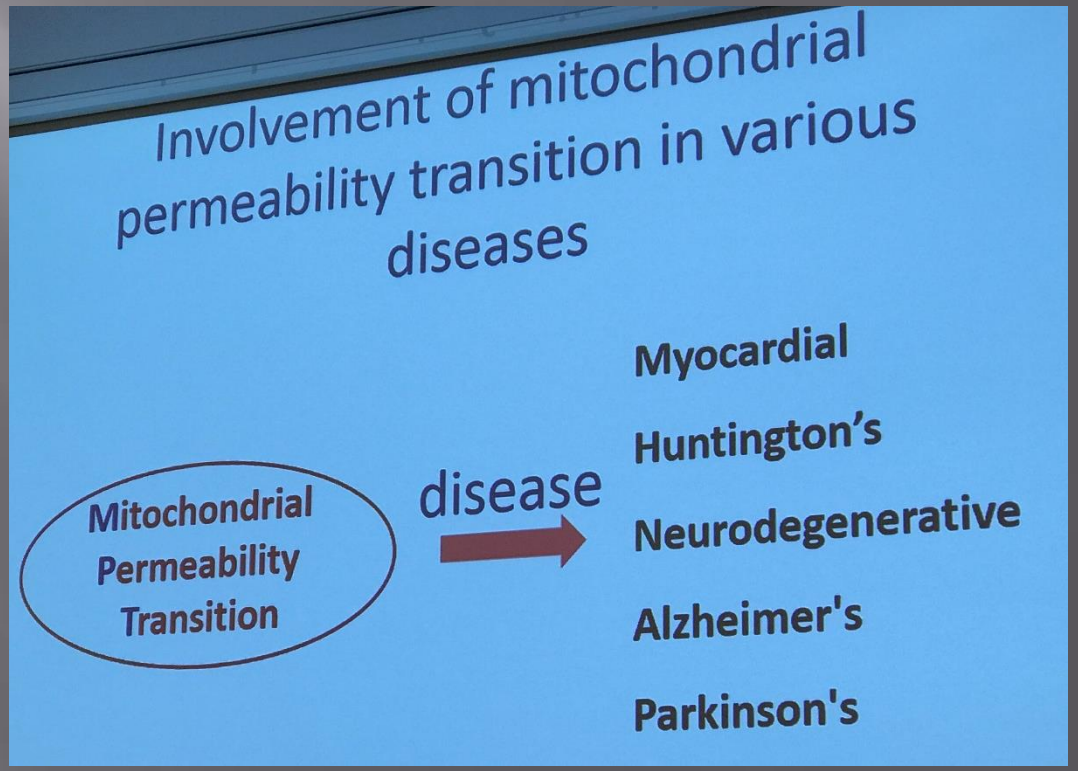
Functions of Mitochondria





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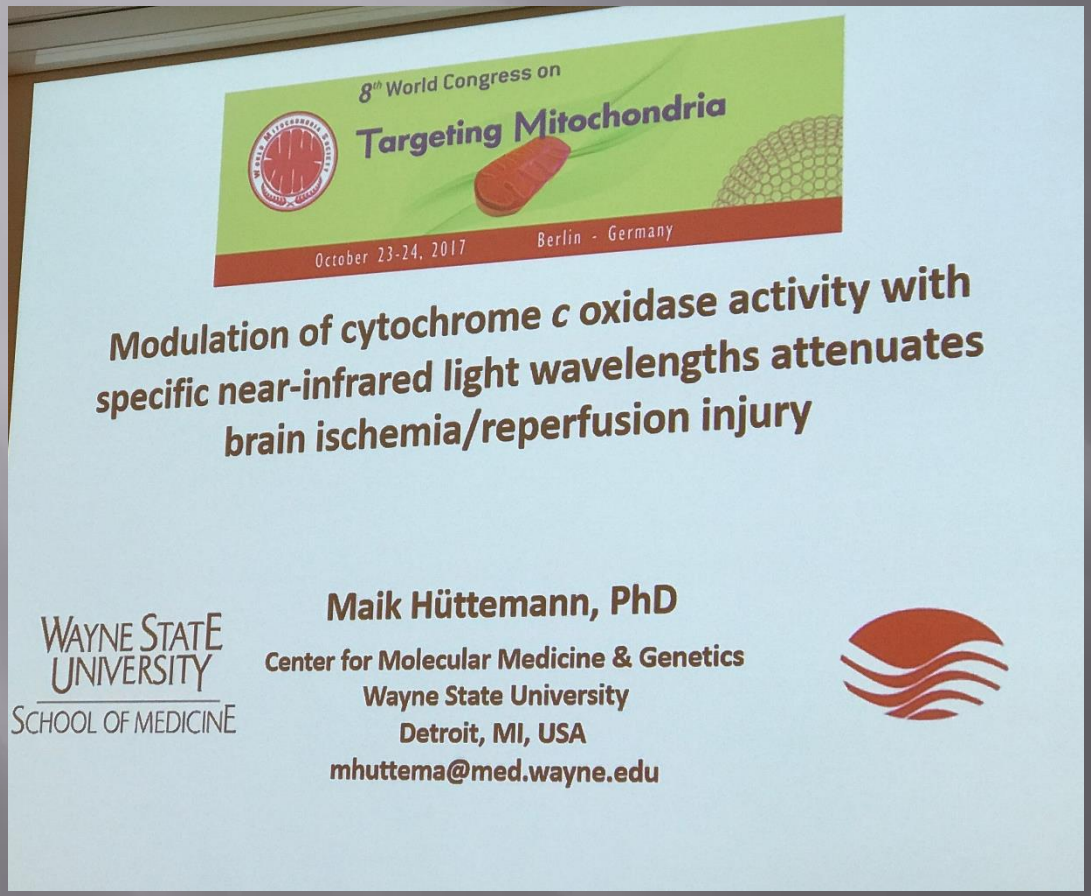
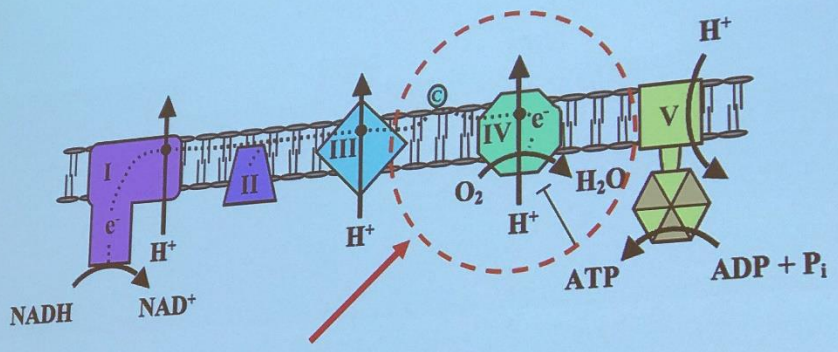
Targeting Mitochondria Berlin October 2017



Targeting Mitochondria
Berlin October 2017

Introduction



- Proposed rate-limiting step
- Photo-acceptor of infrared light (IRL) → copper
- Highly regulated

Cytochrome *c* oxidase and Infrared light
Mechanisms postulated:

- Activation of cytochrome *c* oxidase (COX)
- Increased ATP production
- Photodissociation of NO bound to COX allows oxygen to bind, increasing respiration
- Stimulation of antioxidant pathways, to reduce damage caused by free radicals
- Changes in gene expression

Professor Dr. Herbert Klima Atomic Institute of the Austrian Universities, Vienna, Austria

By using cytometric, photometric and radiochemical methods it is shown that the increase or decrease of cell growth depends:

- on the applied wavelengths (480, 570, 633, 700, 760, 904, 1060, 1270 nm)
- on the irradiance (1 - 5000 J/m2)
- on the pulse sequence modulated to laser beams (constant, periodic, chaotic pulses)
- on the type of cells (leukocytes, lymphocytes, fibroblasts, normal and cancer cells)
- and on the density of the cells in tissue cultures.

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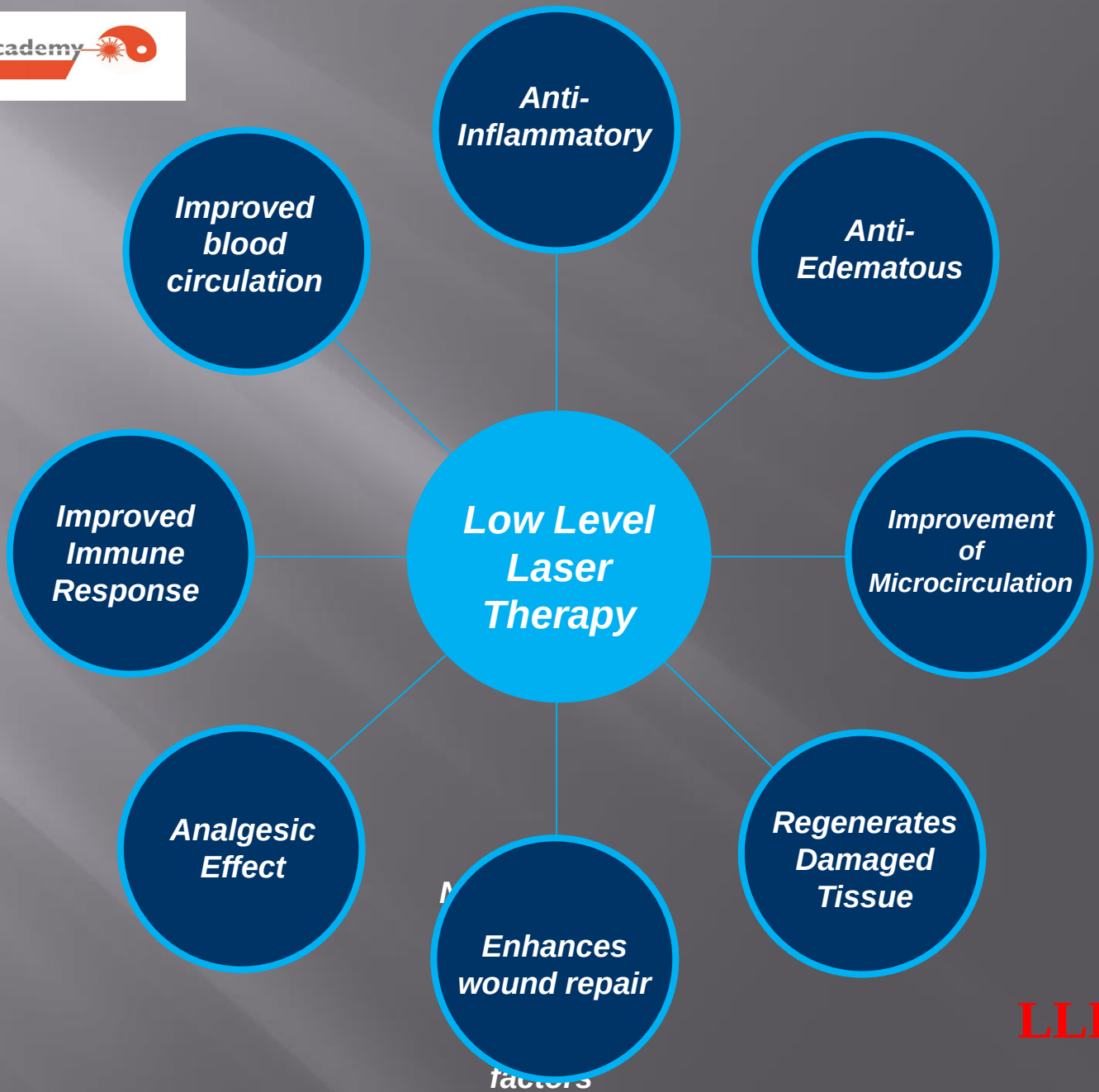

LLLT

Dr. Roberta T Chow/The Lancet 12/2009
Efficacy of LLLT in neck pain

- Systematic review and meta-analysis of randomized placebo controlled trials
  - Total of 820 patients
  - Acute neck pain
  - Control of pain intensity by visual analogue scale

- Findings:
  - No side effects from LLLT
  - LLLT reduces pain immediately after treatment
  - LLLT pain relieve lasts at least up to 22 weeks after completion of treatment

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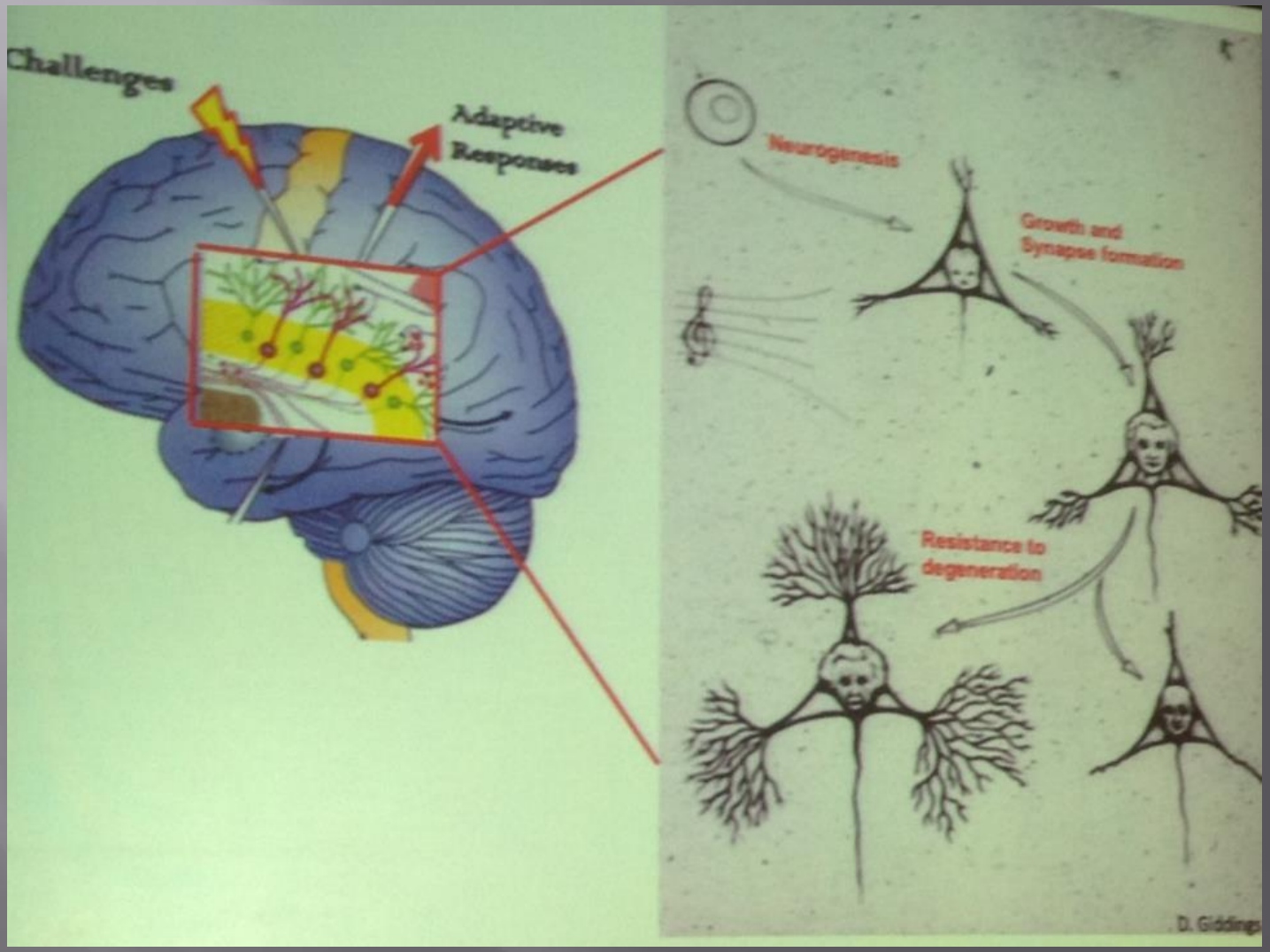
LLLT and brain: *LLLT* to prevent degeneration



Laser Probes

- Laser pen
- Laser – Needle / Light Needle
- Area therapy by laser shower
- Cluster Probe
- Non invasive blood irradiation
- Invasive blood / joint radiation
- PDT
- Class IV Laser

- Homecare / Patient based Devices ("Laserwatch")

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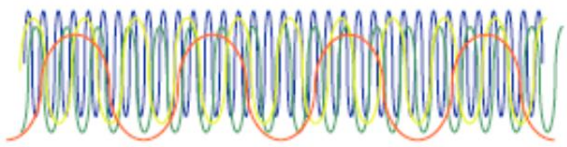
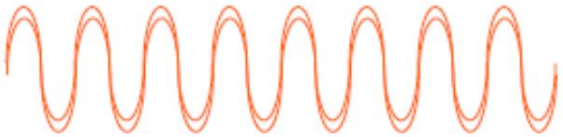


White light
(no coherence of the rays)

Monochromatic light



Laser light

White light

The sun (natural source of light) or a light bulb (artificial source of light) emit light of almost every wavelength in the visible part of the electromagnetic spectrum (approx. 400 – 750 nm). Due to this multitude of colours (polychromatic light) their light looks white.

Monochromatic light

Monochromatic light only contains light waves of a very narrow frequency spectrum. The colour shown by monochromatic light in the visible spectral range is known as its spectral colour.

Laser light

Laser light is monochromatic and "synchronised", i. e. its light waves exhibit a high degree of parallelism and coherence lengths. In optics the coherence length is the maximum difference in distance (space) or duration (time) at which two light rays emitted from the same light source still have a stable interference pattern on overlapping. The high level of alignment of the laser rays results in strong radiant intensity.

Fig: Characteristics of laser beams

Dr. Michael Weber, 2018

A PRACTICAL HANDBOOK

LASER ACUPUNCTURE

SUCCESSFUL TREATMENT CONCEPTS

LLLT = Mitochondrial Medicine

What are the targets of photomedicine ?

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Absorption of light in humans

- Chromophores take up light

- Cytochrome C Oxidase (CCO) - *Copper*
- Porphyrins
- Flavonoids
- NADH
- Vitamin K2

- Are located in mitochondria and in Plasma – membranes

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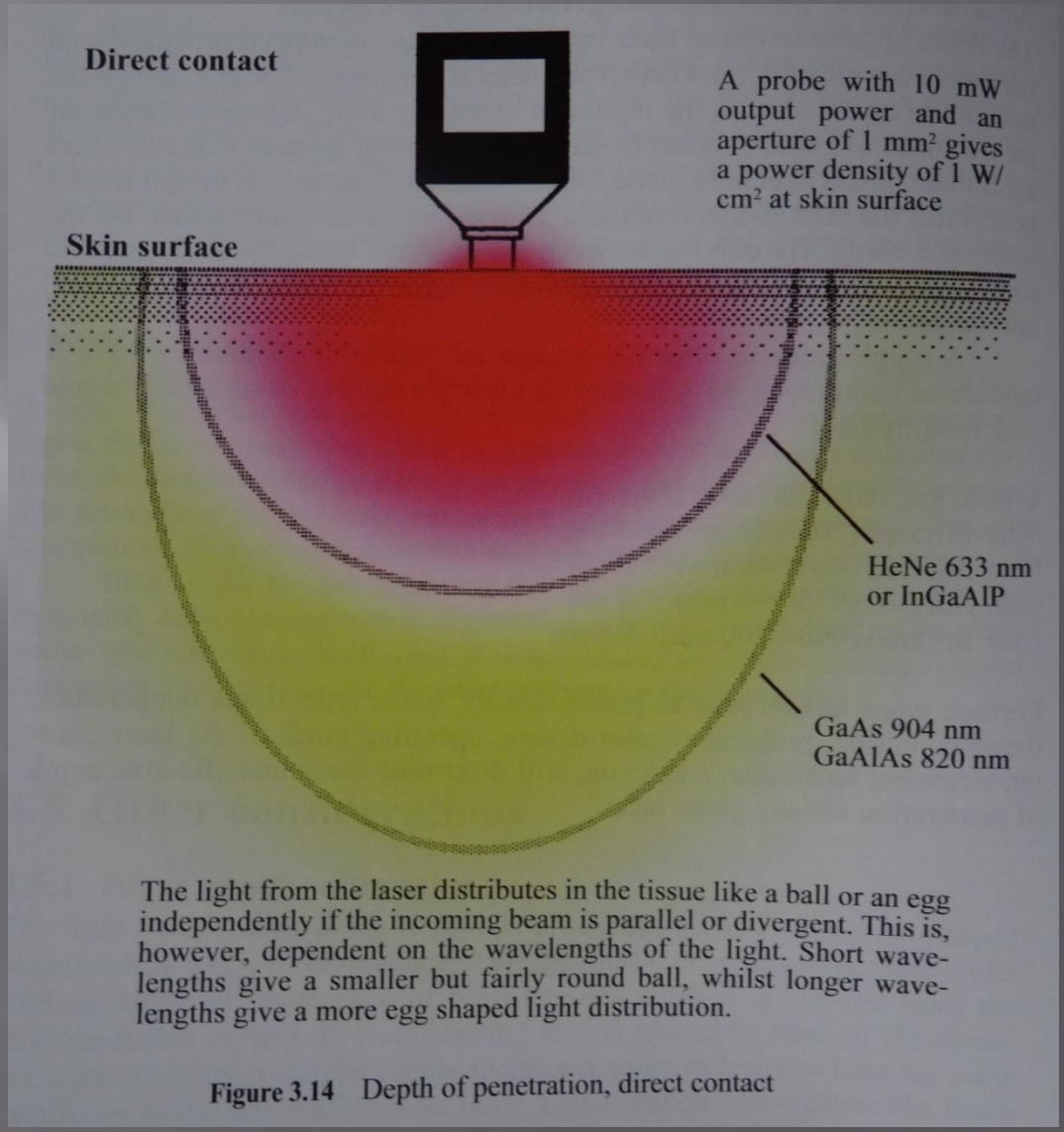
Physiological Effects of *Low Level Laser*

Cascade of Primary, Secondary, Tertiary and Quaternary Responses *(…thanks to James Carroll for Russian Dolls)*

LASER Wavelength



The light from the laser distributes in the tissue like a ball or an egg independently if the incoming beam is parallel or divergent. This is, however, dependent on the wavelengths of the light. Short wavelengths give a smaller but fairly round ball, whilst longer wavelengths give a more egg shaped light distribution.

Figure 3.14 Depth of penetration, direct contact

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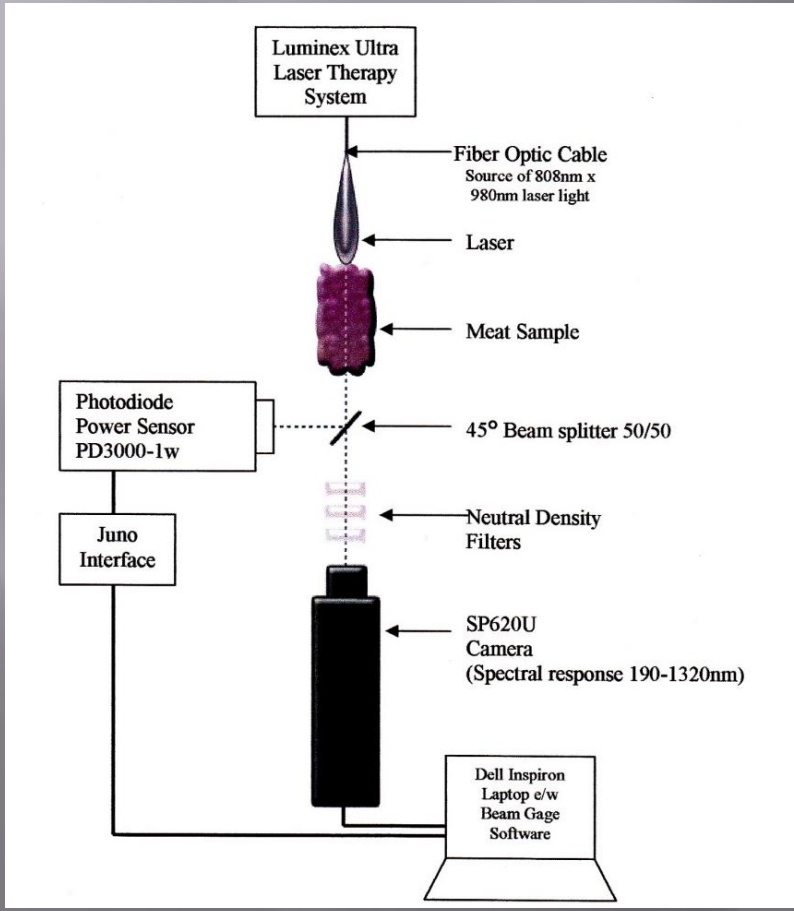
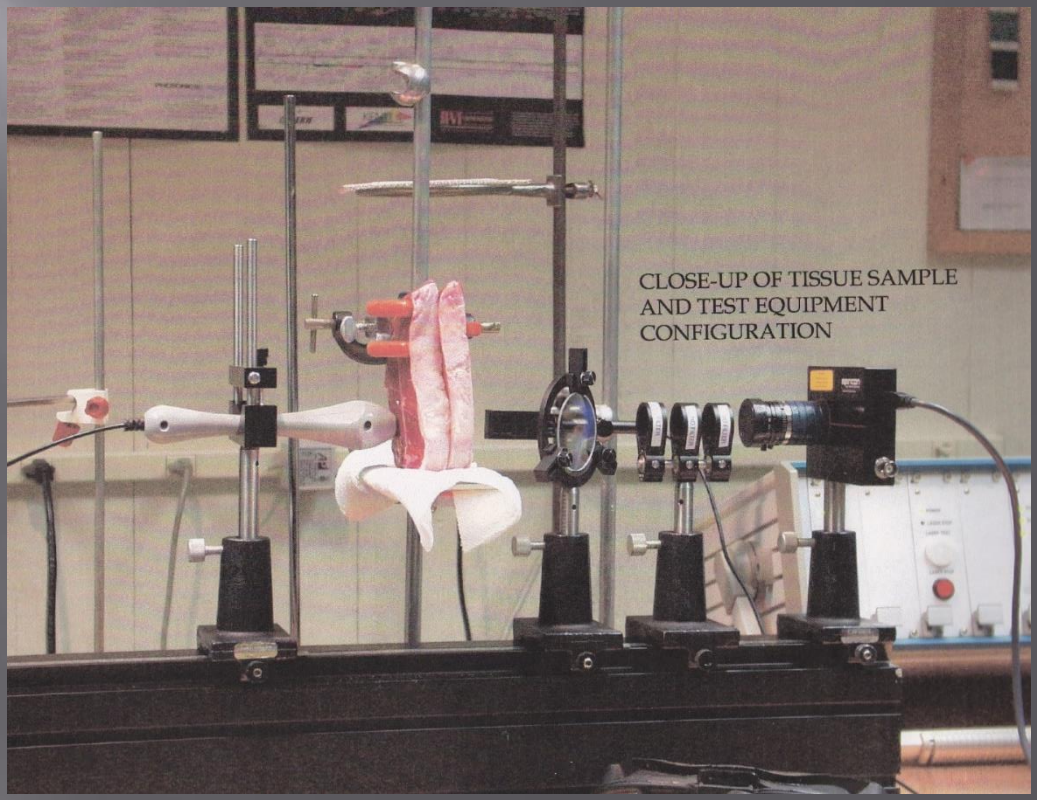
Laboratory test – Penetration depth

Laser probe/fresh meat/sensor





Penetration Depth and Bio - stimulatory window

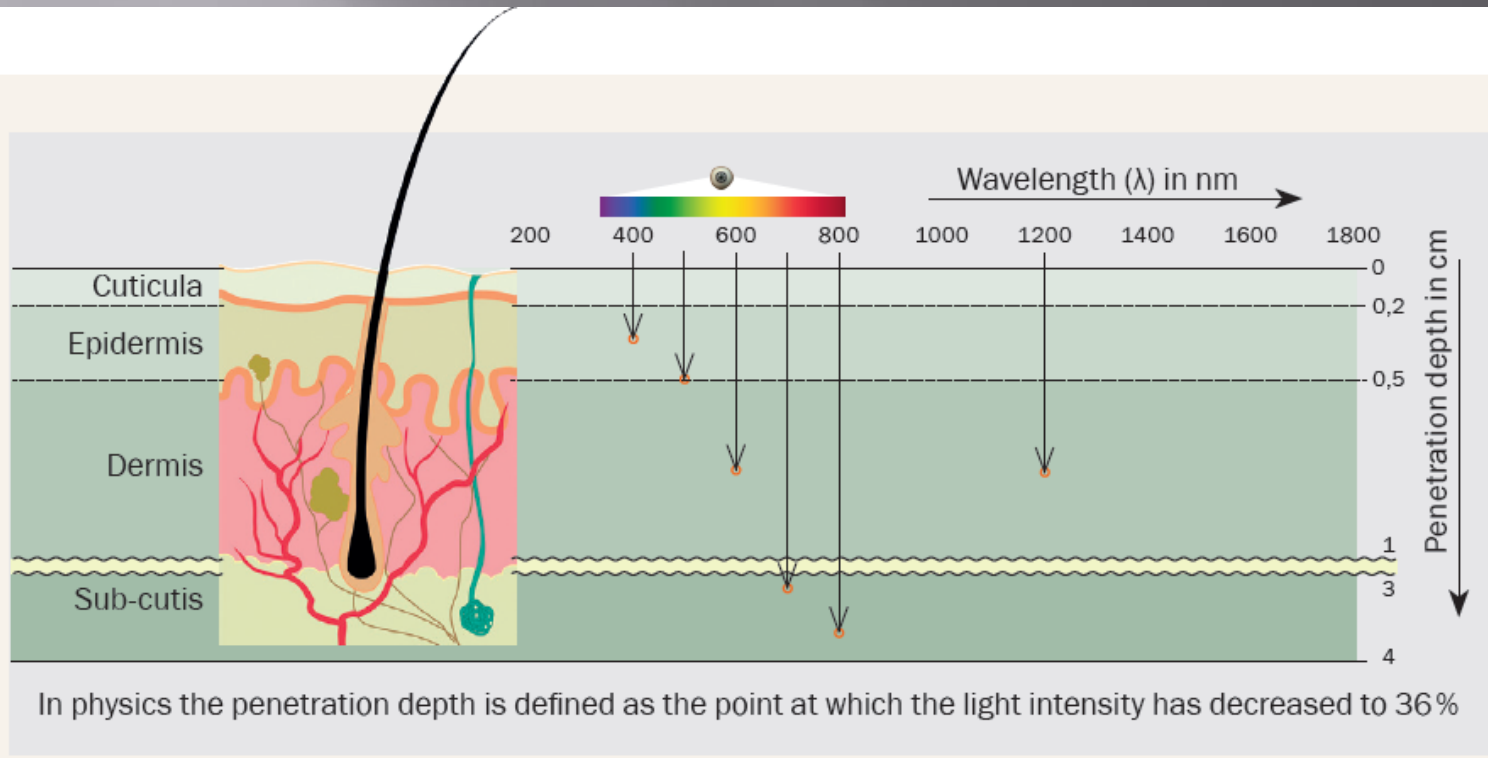


Fig.: Optical window for biostimulation

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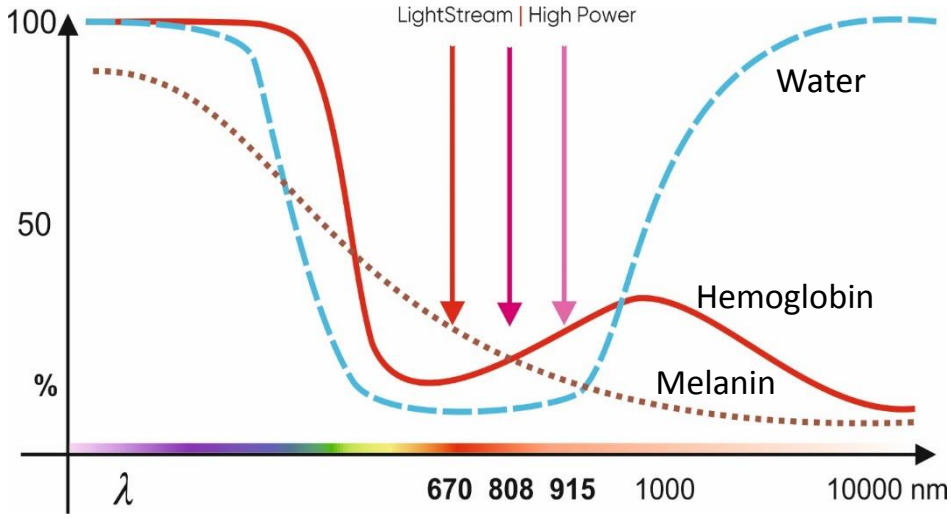
LASER ACUPUNCTURE
SUCCESSFUL TREATMENT CONCEPTS

Optical window

- The penetration, penetration depth, depends on the wavelength (color) and the type of the tissue.
- Achieving a defined amount of energy at the target site (e.g. 4J / cm2) depends on the power and exposure time.

High power= X energy within shorter time
Low power= X energy within longer time

Wavelengths in the optical window



LLLT joint irradiation: invasive

- Application areas of interstitial LLLT:
- Chronic spinal illnesses
- Slipped discs
- Spinal stenosis
- Scar pain after slipped disc surgery
- Neural lesions
- Deep tendinitis

Modern diseases = diet diseases

Modern diseases = acc. mitochondriopathies

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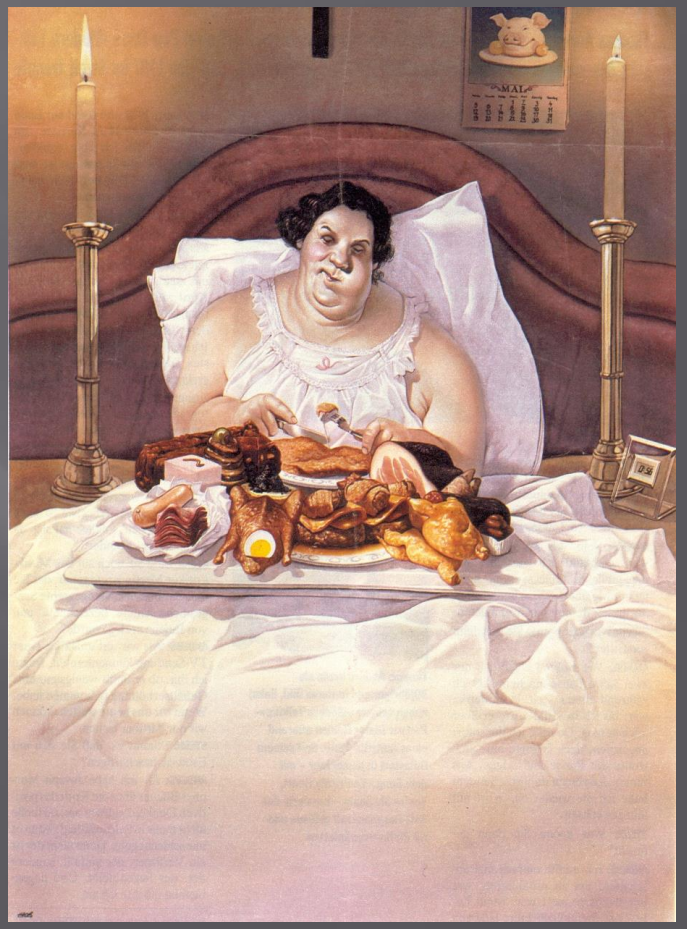
LLLT in Diabetes Mellitus Type II

Diabetic type II patients

- Grade II / III diabetic foot ulceration
- Mean duration of diabetes 10.5 years
- Ulceration present from an average of 6.5 months before treatment
- Mean value of glycosylated haemoglobin was 8.14 mg/dl (6-12.2)
- LLLT by local radiation of the ulcer bed: 660nm; 25mW; 0.6-1.0 J / cm2
- In addition intravenous laser radiation with **650nm**; 1.5 mW for 15-20 min
- Plus Acupuncture infrared 1 J / AP (LI11, SP6, ST36, GB 34)
- Secession every other day
- Total Number of 10-20 secessions



Kazemi-Khoo, N. Successful treatment of diabetic foot ulcers with low-level laser therapy. The Foot. 2006; 16(4): 184-187

LLLT in Diabetes Mellitus Type II

Diabetic type II patients – RESULTS

- After approximately 19 sessions complete recovery was achieved in all cases
- There were no relapses after 6 months
- There were no other problems after 6 months
- No side effects were reported by the patients.

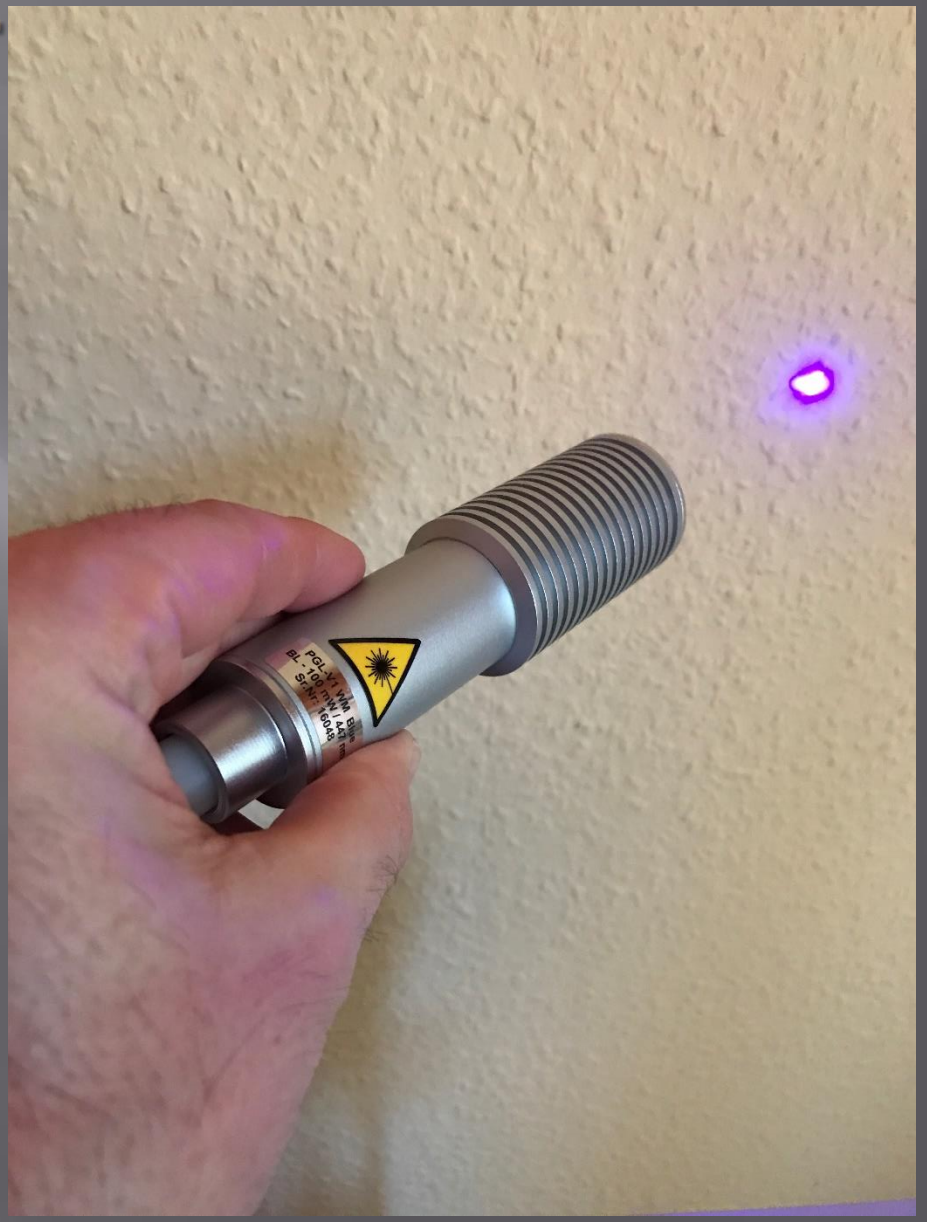
Kazemi-Khoo, N.
Successful treatment of diabetic foot ulcers with low-level laser therapy. The Foot. 2006; 16(4): 184-187

LLLT in Diabetes Mellitus Type II

- 10 Diabetes Type II patients
- 7 – 12 Sessions of **intravenous blue light laser**
- **450nm**, 2.5mW
- Serum blood sugar was measured before and after treatment
- Mean blood sugar was 333.8mg before treatment
- Mean blood sugar level after treatment was 210.5 mg
- Serum blood sugar decreased significantly.

Kazemi-Khoo, N.; Dabaghian, F.:
Effect of Blue light intravenous laser on blood sugar in diabetic type 2 patients. Proc. 7th Internat Congress of WALT, Sun City, South Africa, October 2008, page 94

Intravenous LLLT



Laser Blood Irradiation

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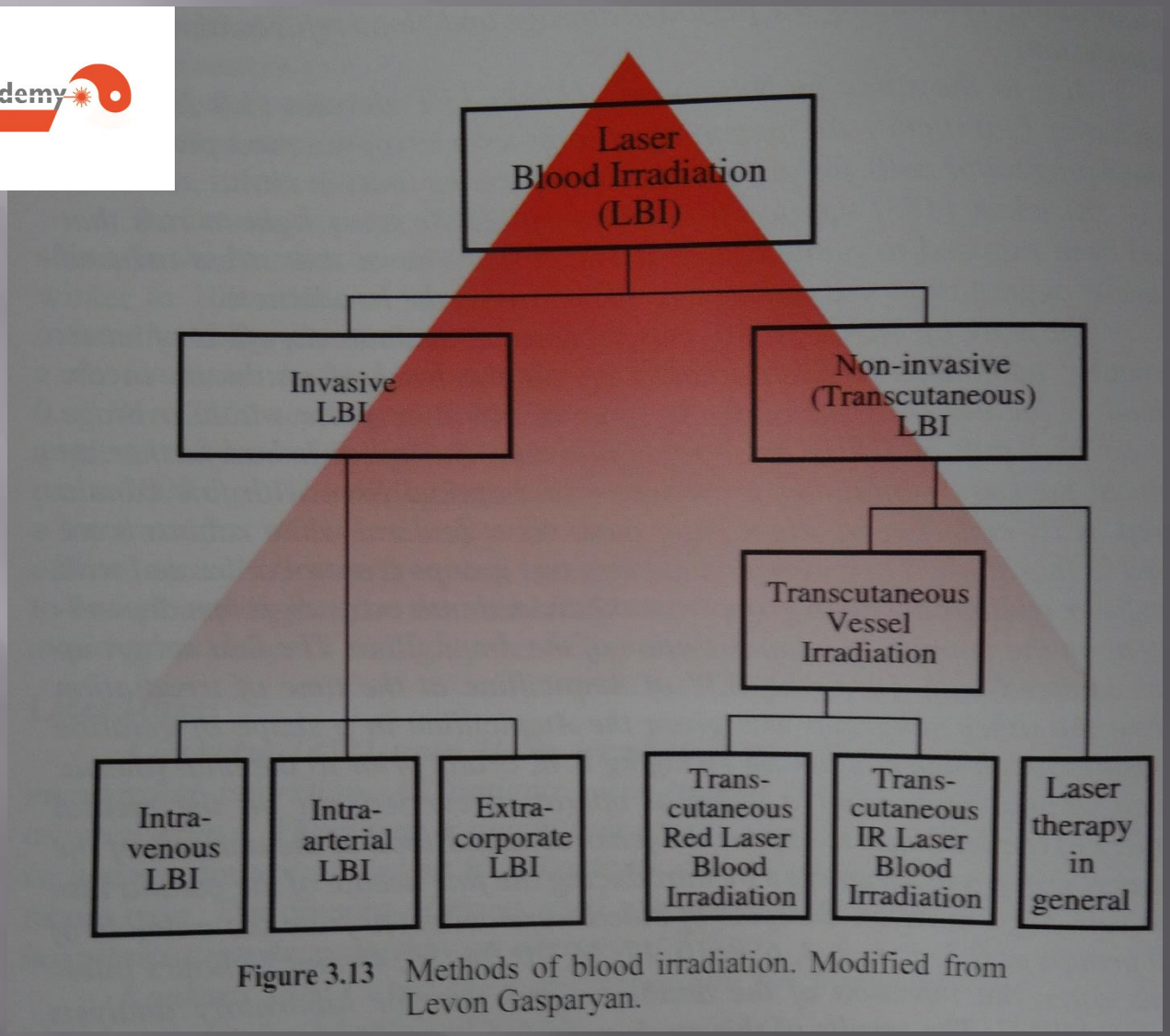

Figure 3.13 Methods of blood irradiation. Modified from Levon Gasparyan.

Laser blood irradiation:

- LLLT for blood irradiation:
  - Vascular diseases
  - Heart insufficiency
  - Immune disorders
  - Allergies
  - Diabetes
  - Chronic liver disease
  - Chronic kidney disease
  - Dyslipidaemia
  - Depression
  - Fatigue syndrome
  - Burn Out Syndrome

Laser - Watch

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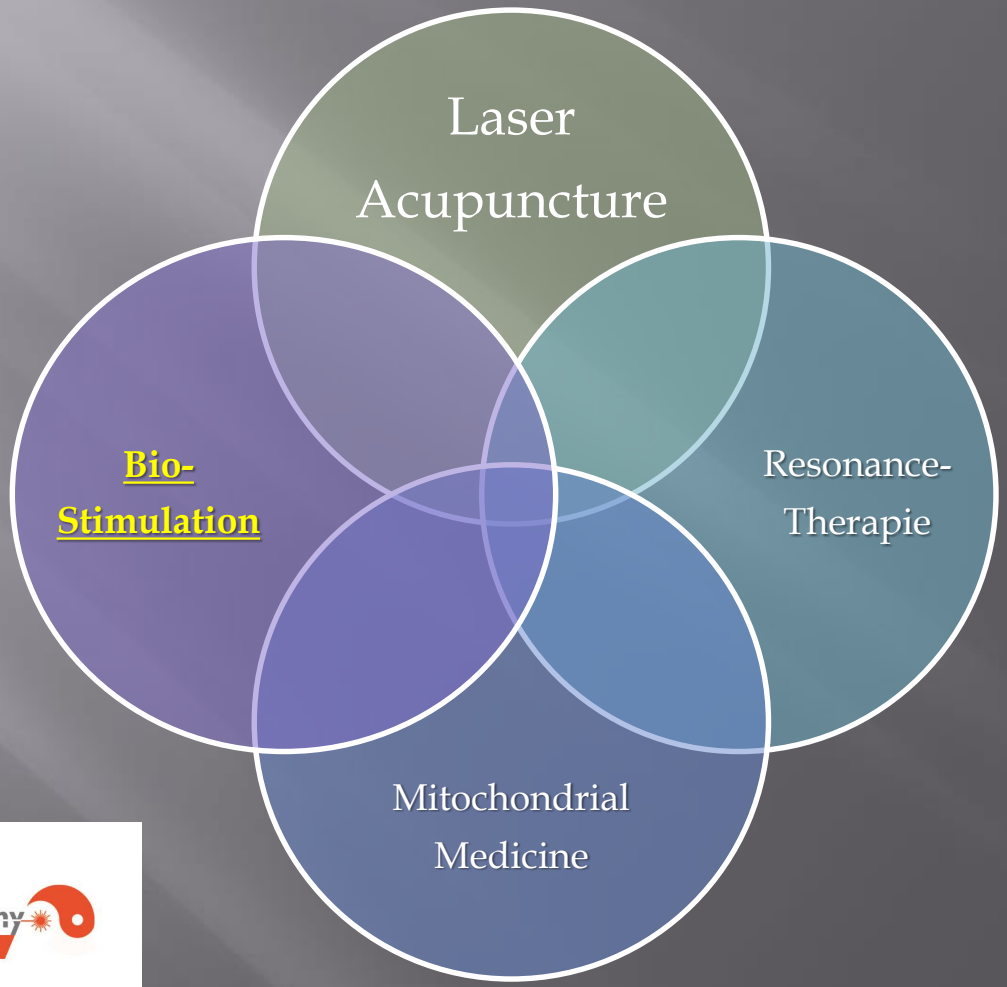
LLLT: more than only Acupuncture!



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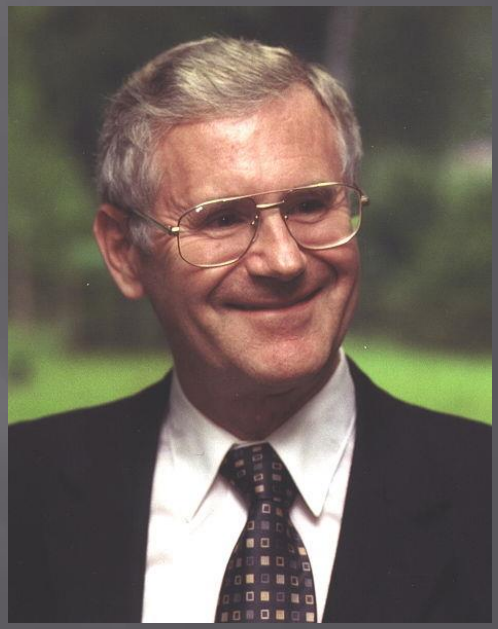
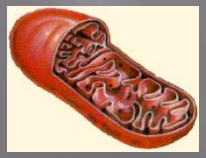
Mitochondrial Medicine in TCM / *LLLT* - Clinic

LLLT and Mitochondrial Function

„Just hold anyone's hand and feel the temperature. **Gramm by gramm the hand converts more than 10.000 times more energy as the sun**. Hard to believe? Here are the facts: On average the humans body weight is 70 Kilogram and burns daily about 12.600 Kilojoules; that equal about 2 Mill joule / Gramm and Second, or 2 Mill watt / Gramm. For the sun it is only just 0,2 Micro joule / Gramm and Second.“





Gotfried Schatz

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Mitochondria

www.diabetesfond.se

1856 Kolliker: Detection of round - oval structures along the striated muscular fibrils

1898 Altmann: Mitochondria derive from Bacteria
2 trillion body cells (2×10^{12})
2.000 trillion Mitochondria: 70 kg ATP pro Tag !

1962 Luft: Detects acquired Mitochondriopathy

1972 Tandler: Genome has a ring structure

1994 1. Article on mitochondrial Medicine by Rolf Luft

2003 Tallberg*: Targeted Mitochondria- leaguer of a tumour cell leads to a Re - Differentiation !!

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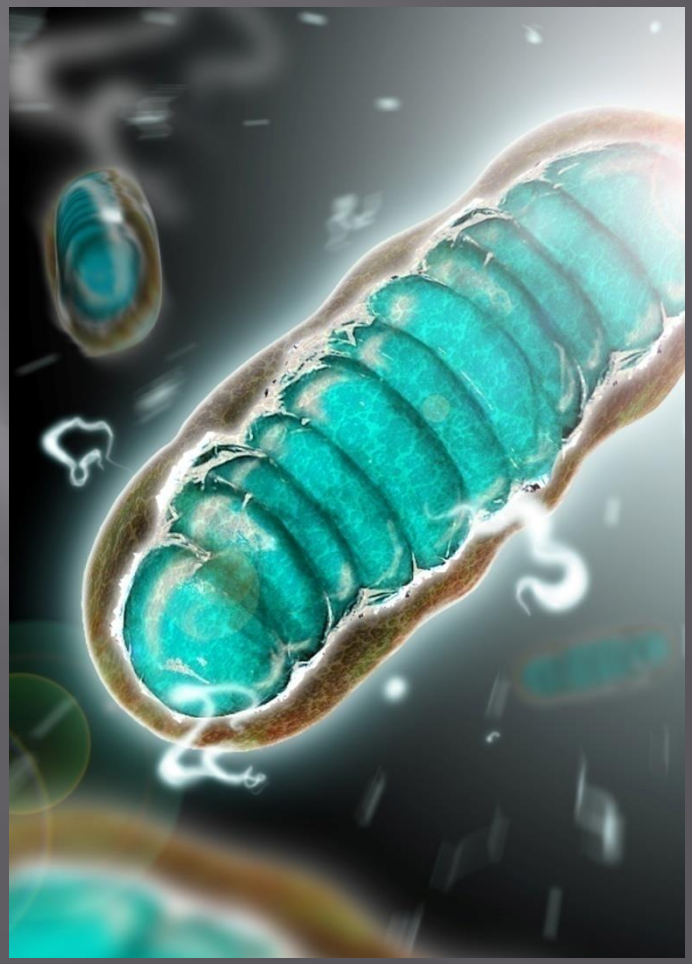
*Tallberg, Th., Deutsche Zeitschrift für Onkologie, 2003; 35: 78-99

LLLT and Mitochondrial Function

- The number of mitochondria in each cell is strictly correlated with the energy metabolism of the organ:
  - Thrombocytes : 2 – 6
  - "Oocyte": 100 000
  - Heart muscle cell: 38 % of cellular volume



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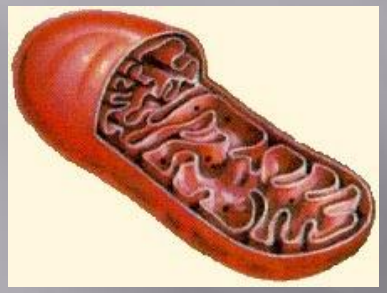
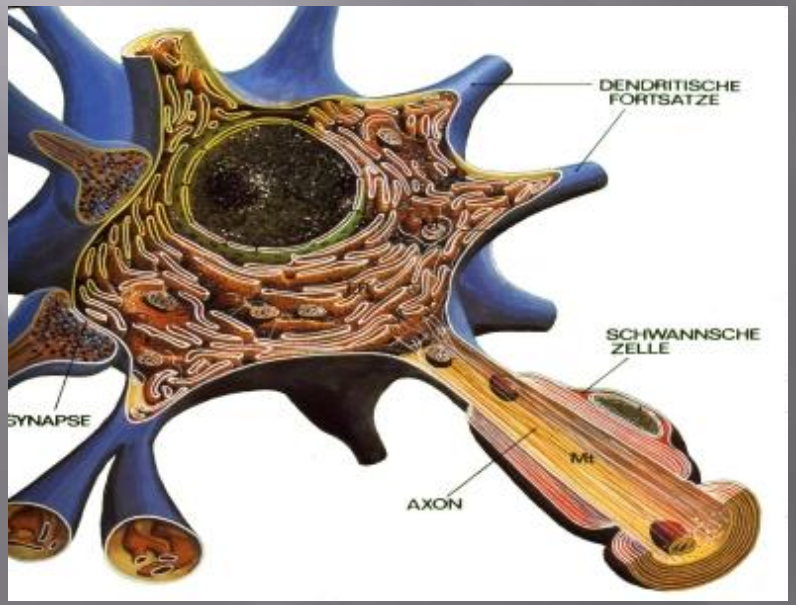
Mt = Mitochondria





- 2 – 5 µm in length
- 2 µm in diameter
- smooth outer membranes (with antenna pigments)
- Intensive folded inner membrane with multiple cristae
- Inner Mt – Membrane = Enzymes of Mt - metabolism

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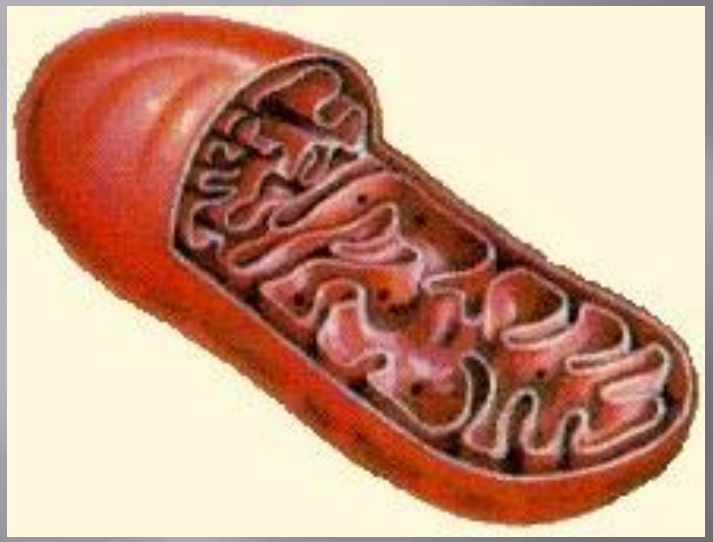
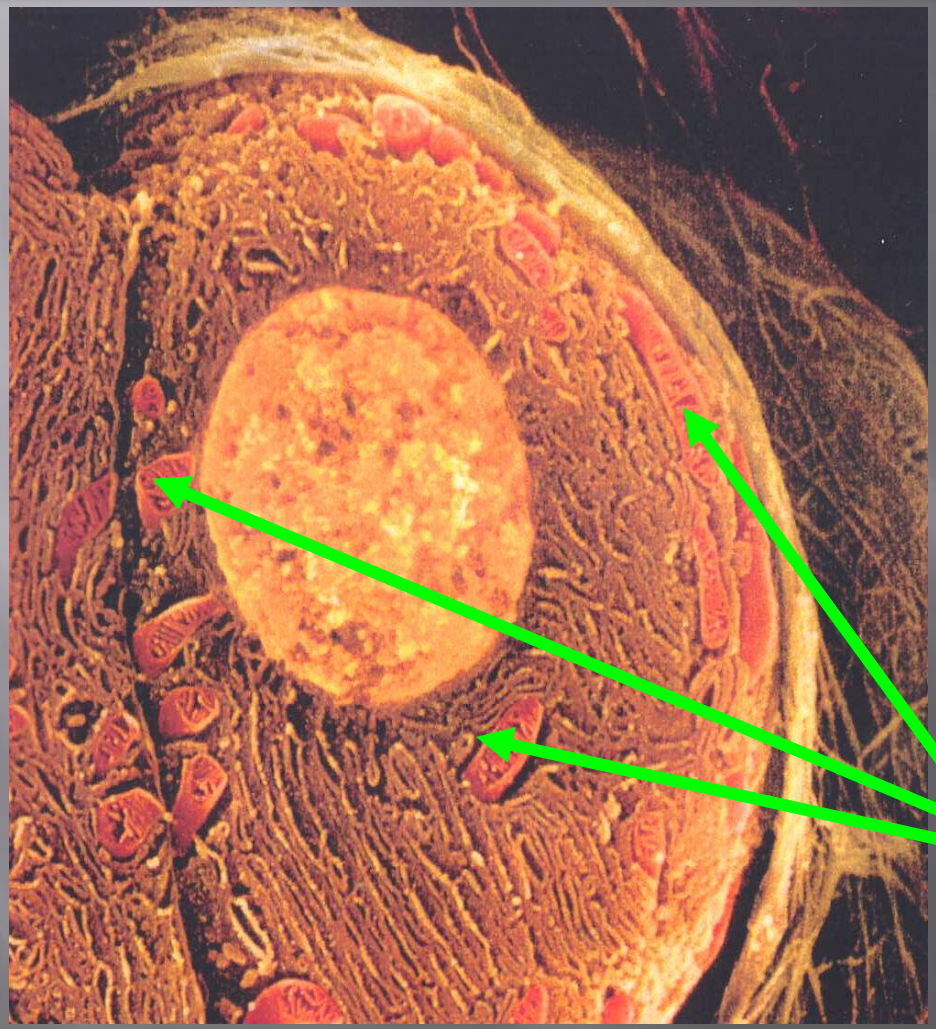
Mt = Mitochondria



- Mt have their own, ring-shaped DNA
- 37 Gene are located on the Mt – DNA
- Mt – DNA is unprotected within the Mt - Matrix

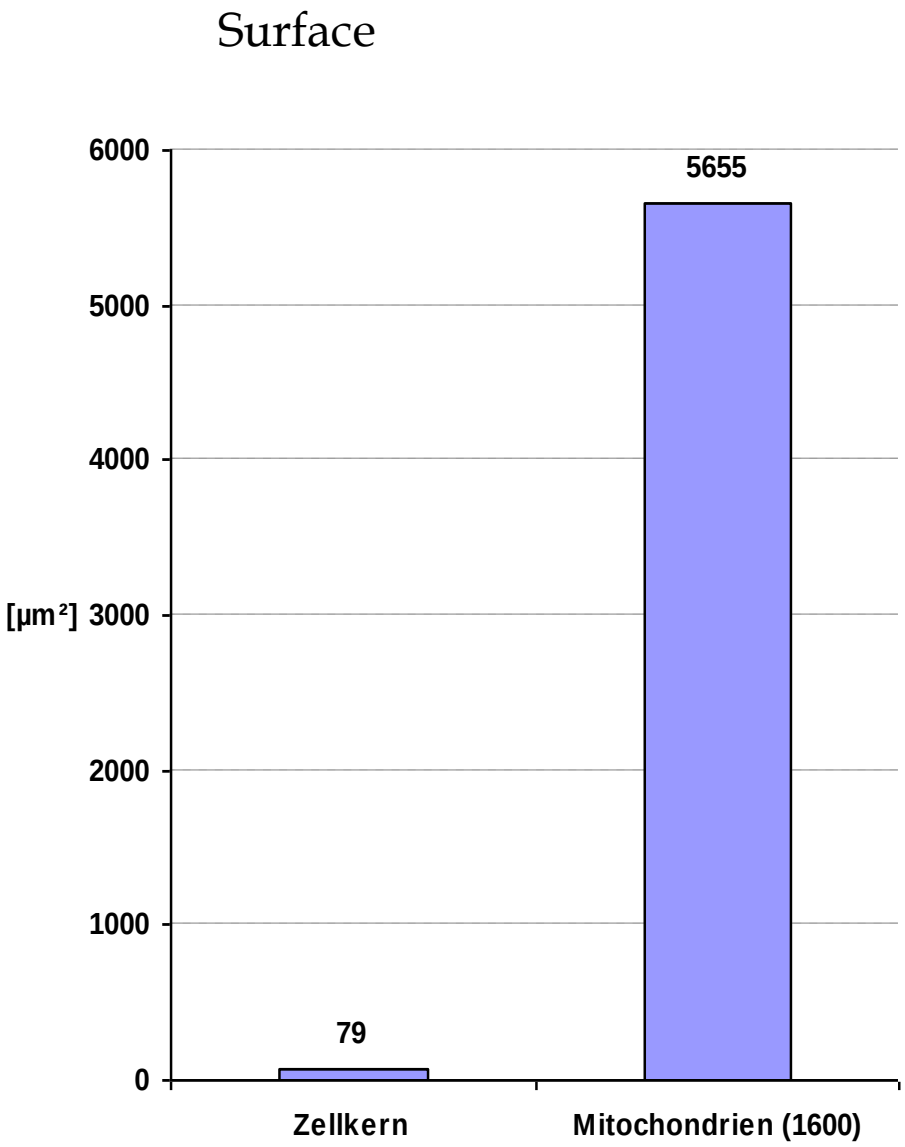
Mitochondria: microscopic view

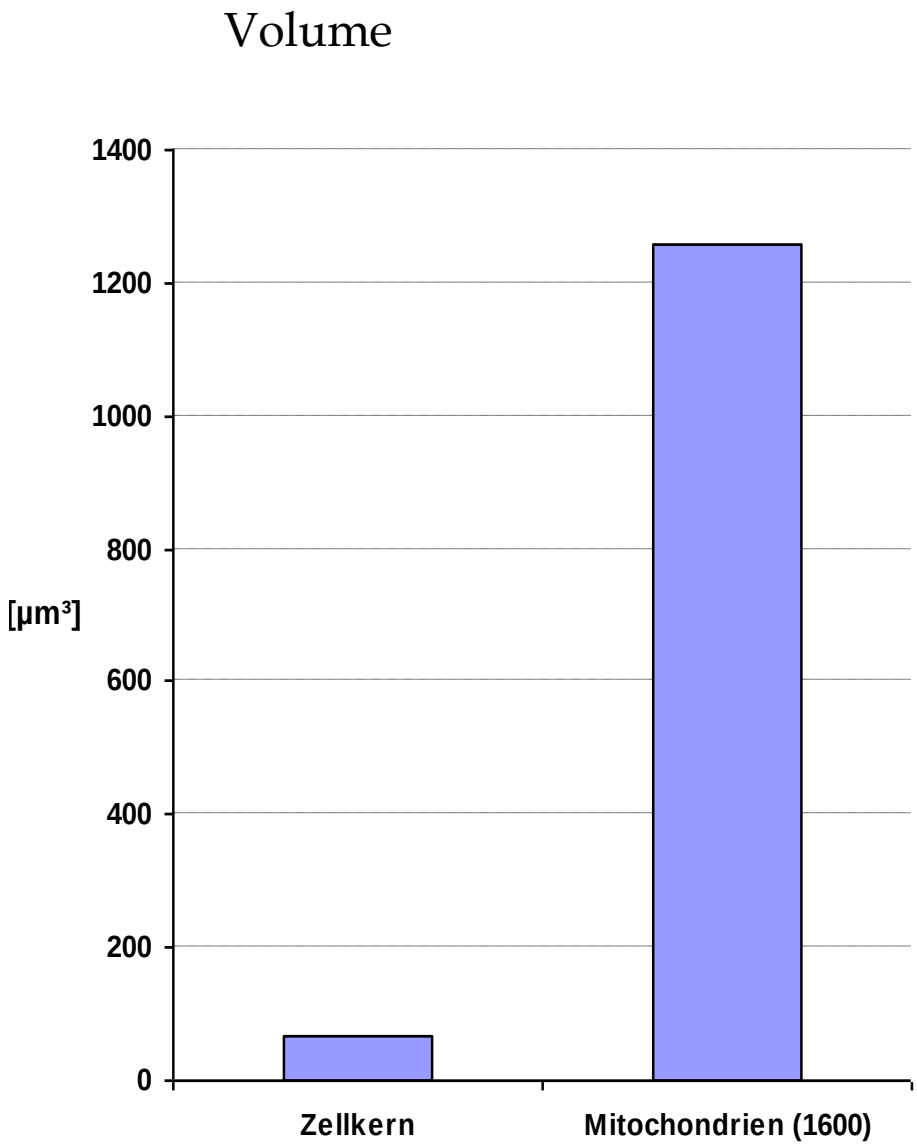


Cell nucleus was peeled off to see all internal structures.

The gland cell contains a variety of mitochondria in 15000 fold magnification.

Size Ratio


Surface
6000
5000
4000
3000
2000
1000
0
[µm²]
5655
79
Zellkern
Mitochondrien (1600)


Volume
1400
1200
1000
800
600
400
200
0
[µm³]
Zellkern
Mitochondrien (1600)

Chronic Toxic:

Instable CS, Fear a. psychics burdens, sleep disturbance, noise, environmental poisons, drugs, vaccinations, smoking, alcohol, poor diet, …

Activation of Stress hormones, proinflammat. Cytokine and Mediator

H_2O_2, $HO^{\cdot}$, $O2^{-\cdot}$, $NO^{\cdot}$, $ONOO^{-}$, => chronic inflammation

Harming and Blockade of Amino acids, FS, Vitamin, Enzyme, Membrane, DNS and Mitochondria

Break down of Metabolism and Energy supply.

Burnout, CFS, Depression, Fears, Sleep disorders, Headache / Migraine, Fibromyalgia, Foot- Intolerance, Rheumatics Diseases, Allergy, Atopic Eczema, Psoriasis, Thyroid disease,
Heart, Diabetes m. Typ II, Maculadegeneration, MS, MCS, ALS, Alzheimer, Parkinson, Krebs, and many more. ;

4 main functions of Mitochondria

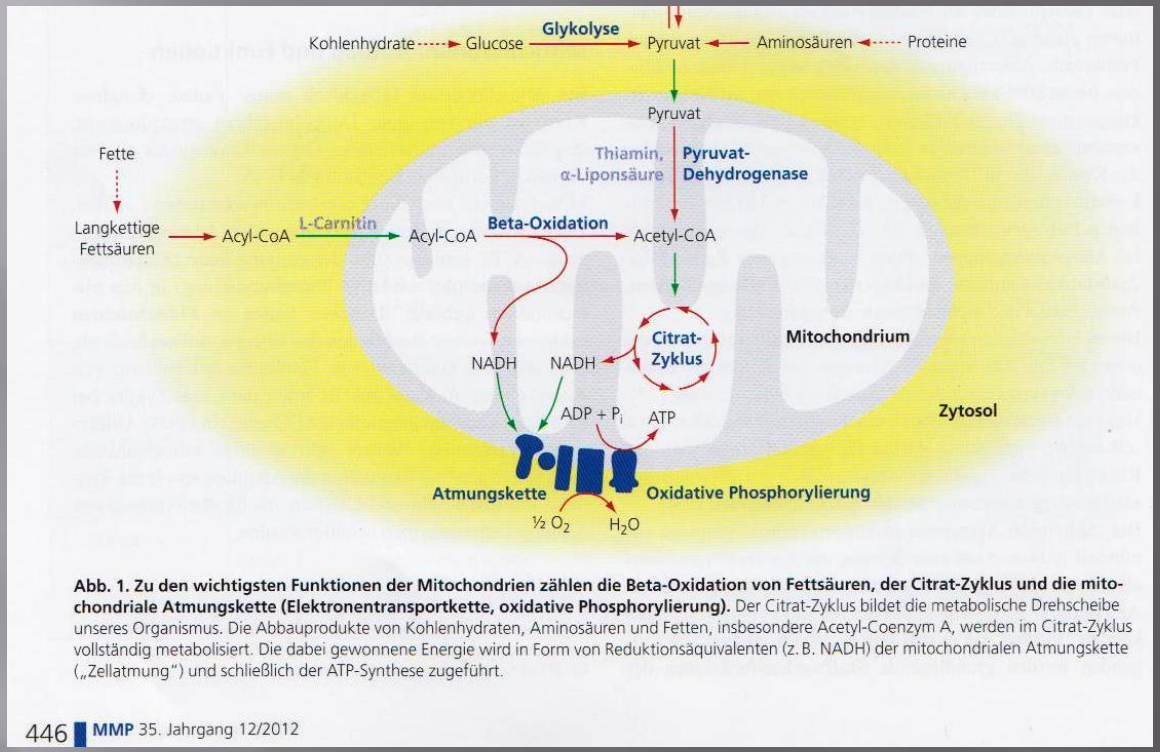


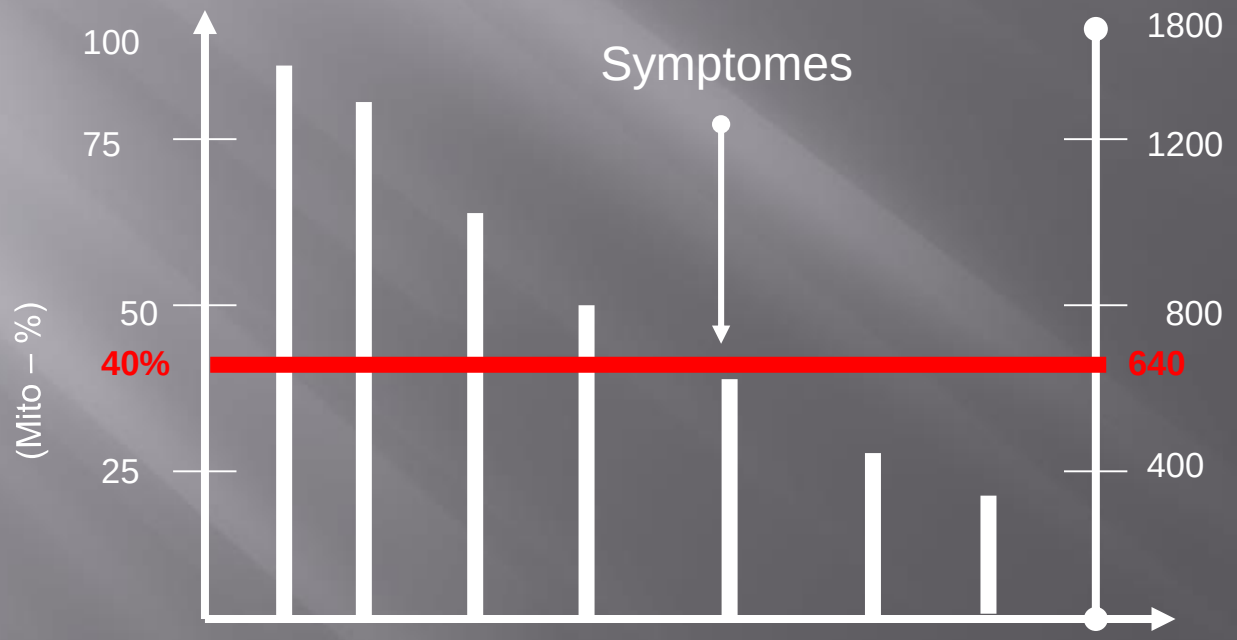
Abb. 1. Zu den wichtigsten Funktionen der Mitochondrien zählen die Beta-Oxidation von Fettsäuren, der Citrat-Zyklus und die mitochondriale Atmungskette (Elektronentransportkette, oxidative Phosphorylierung). Der Citrat-Zyklus bildet die metabolische Drehscheibe unseres Organismus. Die Abbauprodukte von Kohlenhydraten, Aminosäuren und Fetten, insbesondere Acetyl-Coenzym A, werden im Citrat-Zyklus vollständig metabolisiert. Die dabei gewonnene Energie wird in Form von Reduktionsäquivalenten (z. B. NADH) der mitochondrialen Atmungskette („Zellatmung") und schließlich der ATP-Synthese zugeführt.

Modified after Uwe Gröber

- Begin of Glucose neogenesis
- Citrate cycles for NADH- und FADH- production
- β-Oxidation of fatty acids
- OxPhos of mt- complexes I to V

The chronically ill patient

Reduction of healthy Mitochondria

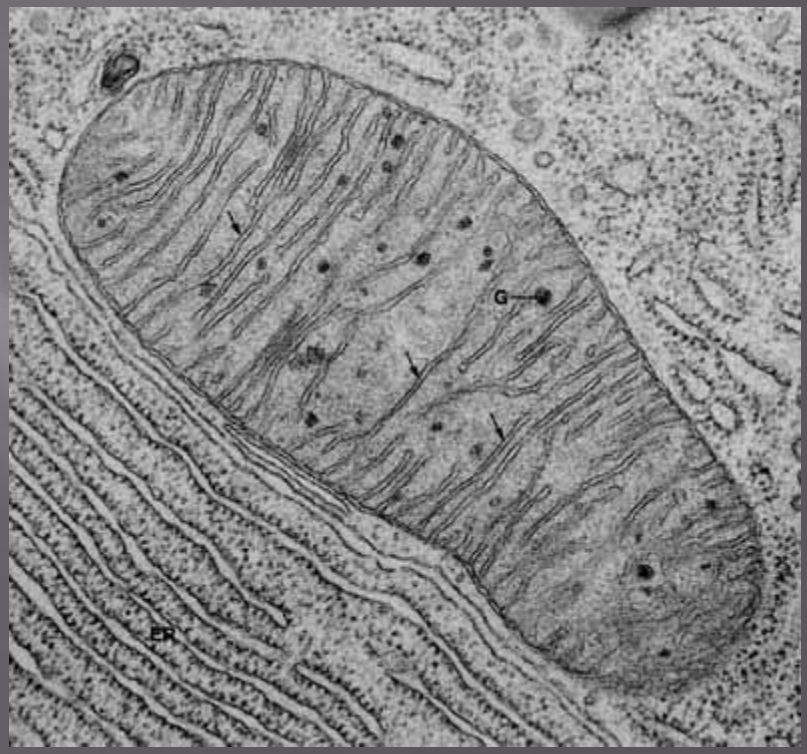


At a level of **60% damaged Mitochondria** , the typical symptoms of a chronic disease occur.

Physiology of Mitochondria

D. Harmann:

Aging
= Intoxication with ROS



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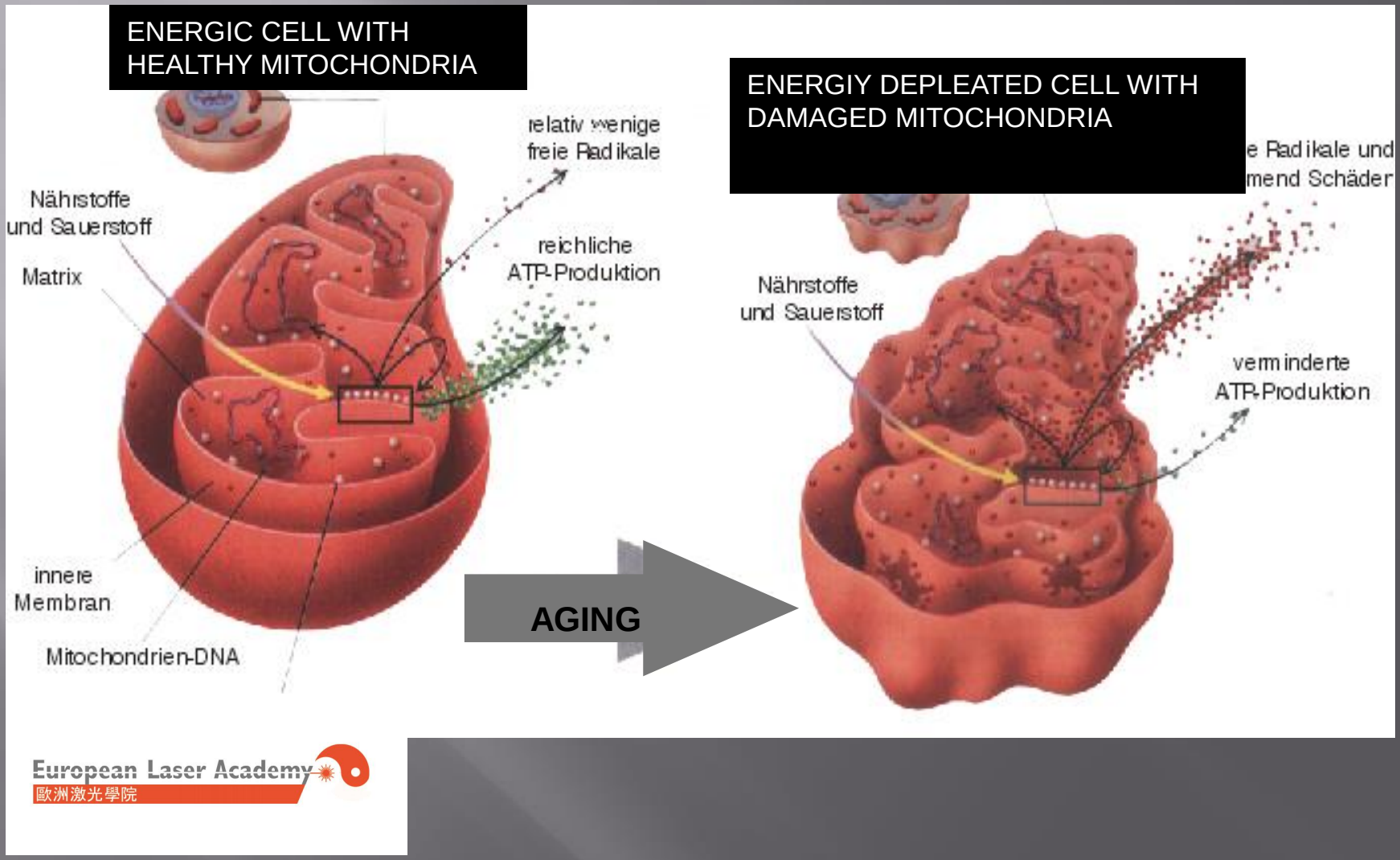
Secondary Mitochondriopathy



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Absorption of light in humans

- Chromophores take up light

- **Cytochrom C Oxidase (CCO)** - *Copper*
- Porphyrines
- Flavinoides
- **NADH**
- Vitamin K2

- Are located in mitochondria and in Plasma – membranes

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Photo-Intravenous Therapy

- **Red laser :** Stimulation of the immune system, photosensitizing effects on haemato-porphyrins and chlorins, activates metabolism
- **Green laser:** Increased oxygen supply
- **Blue laser:** Increased Nitro-oxide, bactericidal effects, photosensitizing effects on Curcumin
- **Yellow laser**: Detoxification, antidepressive, photosensitizing effects on Hypericin

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from corpuscular aspects to biophotonic phaenomon

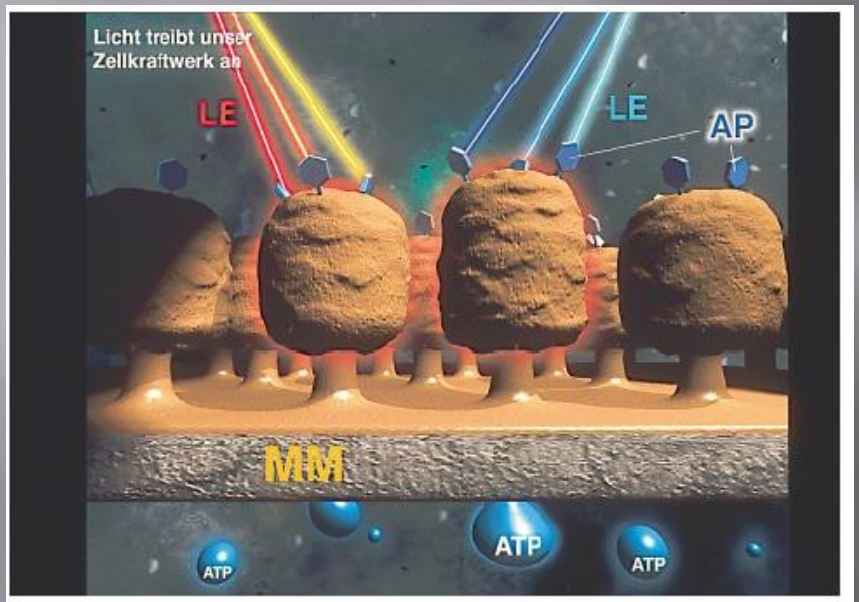


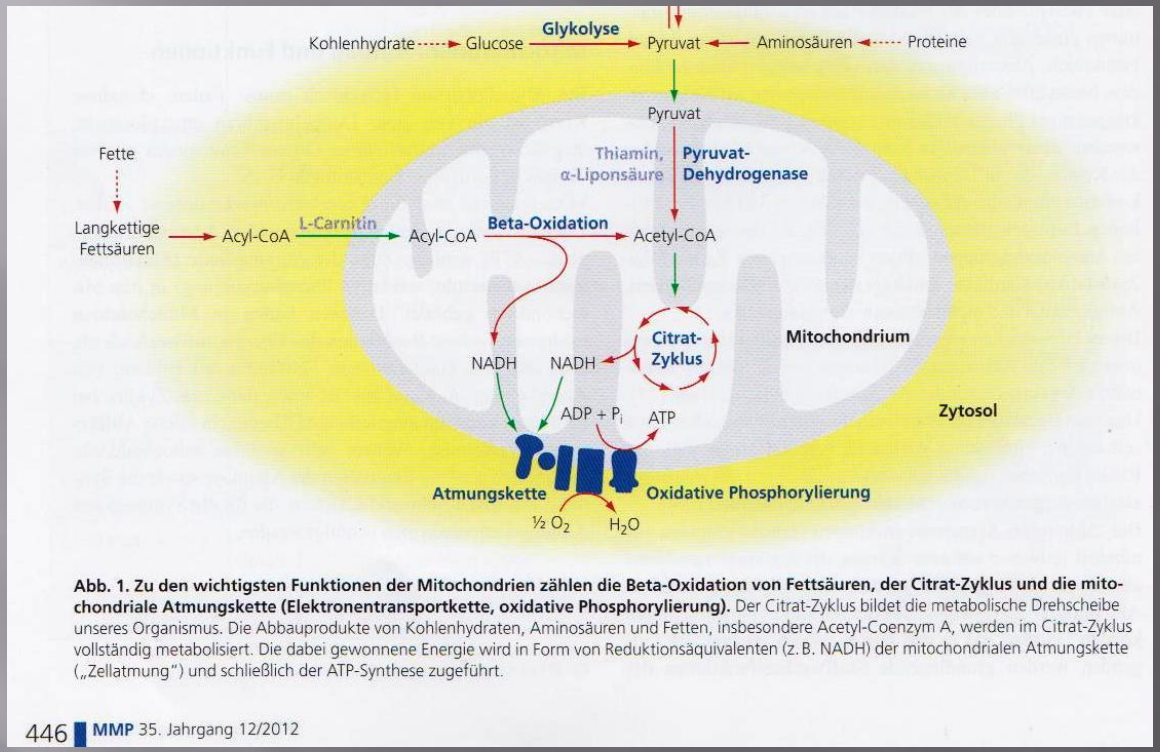
Abb. 5: Die in die innere Mitochondrienmembran(MM) einstrahlende molekulare Bindungsenergie (LE) kann von den dort vorhandenen molekularen Strukturen (AP= Antennenpigmente bzw. Elektronencarrier) absorbiert und zur Adenosintriphosphatsynthese (ATP) genutzt werden.

Komponente	Absorptionsbanden (nm)		
	Soret-Bande	β-Bande	α-Bande
NADH/NAD	300–340		
Flavoproteins	350–490	470–490	580–630
Ubichinon Q	270–410		
Cytochrome b	450–465	520–530	558–562
Cytochrome c_1	370–380	530	555
Cytochrome c	410–415	521–528	551–557
Cytochrome a	420–450	520–540	603–605
Cu A			830
Cu B			760
Cytochrome a_3		520–540	806

Die Absorptionsbanden im UV-Bereich (etwa 20 bis 300 nm) stammen von den Aminosäuren des enthaltenen Proteins wie beispielsweise Tryptophan und Tyrosin; die Soret-, β- und α-Banden von den prosthetischen (Metall-)Gruppen.

Tabelle 2: Absorptionsbanden der Photoabsorptionsspektren wichtiger Elektronencarrier der mitochondrialen Atmungskette.[4,14,15]

4 main functions of Mitochondria



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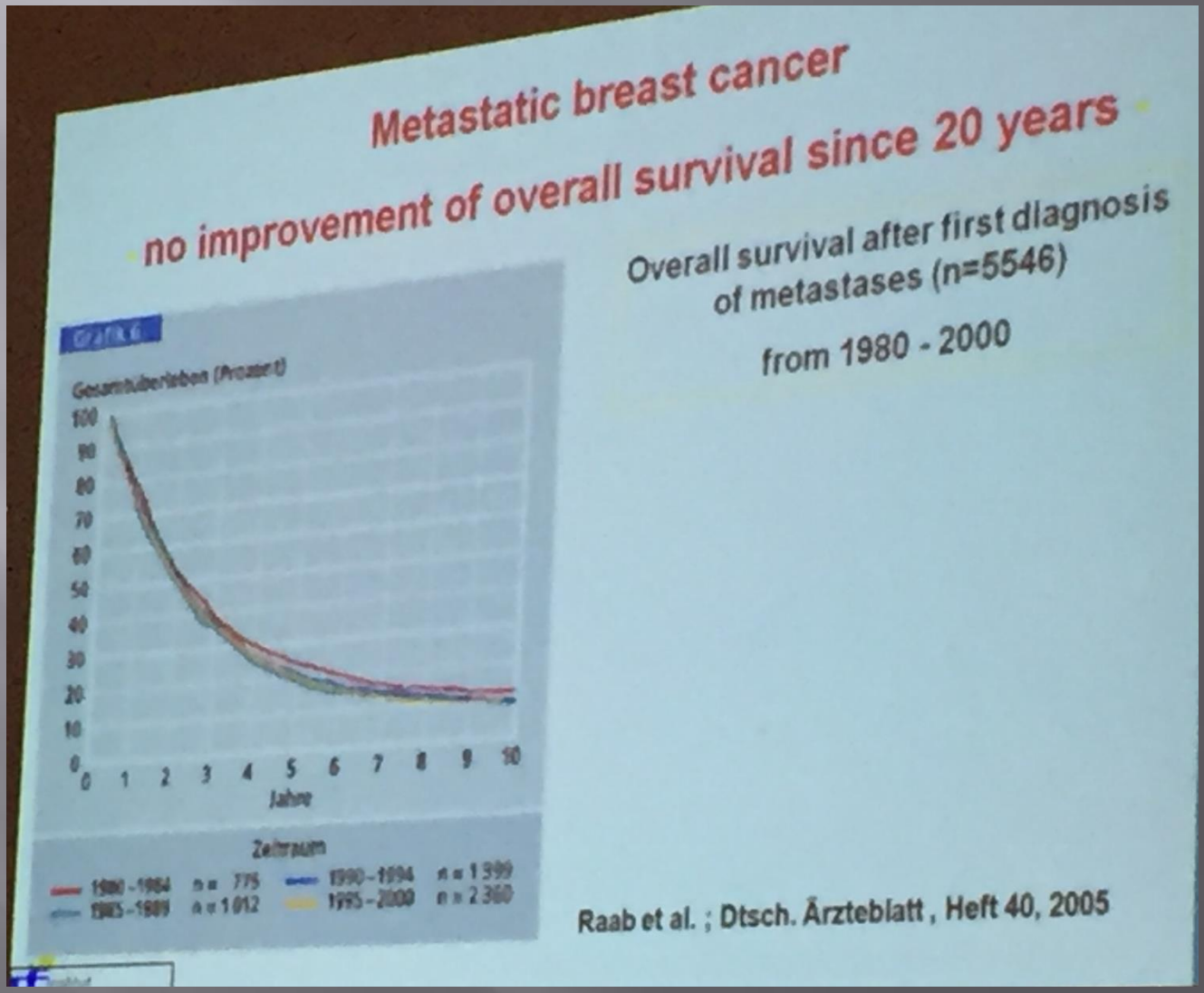
Cancer Facts

- Cancer is the fastest growing disease on earth
- By 2030 there will be as many as 22 million cases worldwide (14 million in 2012)
- The top six highest cancer rates in 2012 are Denmark, France, Australia, Belgium, Norway, and USA (Germany #18)
- Cancer afflicts 1.7 million Americans each year and kills 600,000 of them – over 1,600 per day! (200,000 in Germany and 2.2 million in China)
- There will be more Americans die in the next two years than died in combat in all the wars the United States has ever fought combined
- 1 in 2 American men and 1 in 3 American women will be diagnosed with cancer in their lifetimes

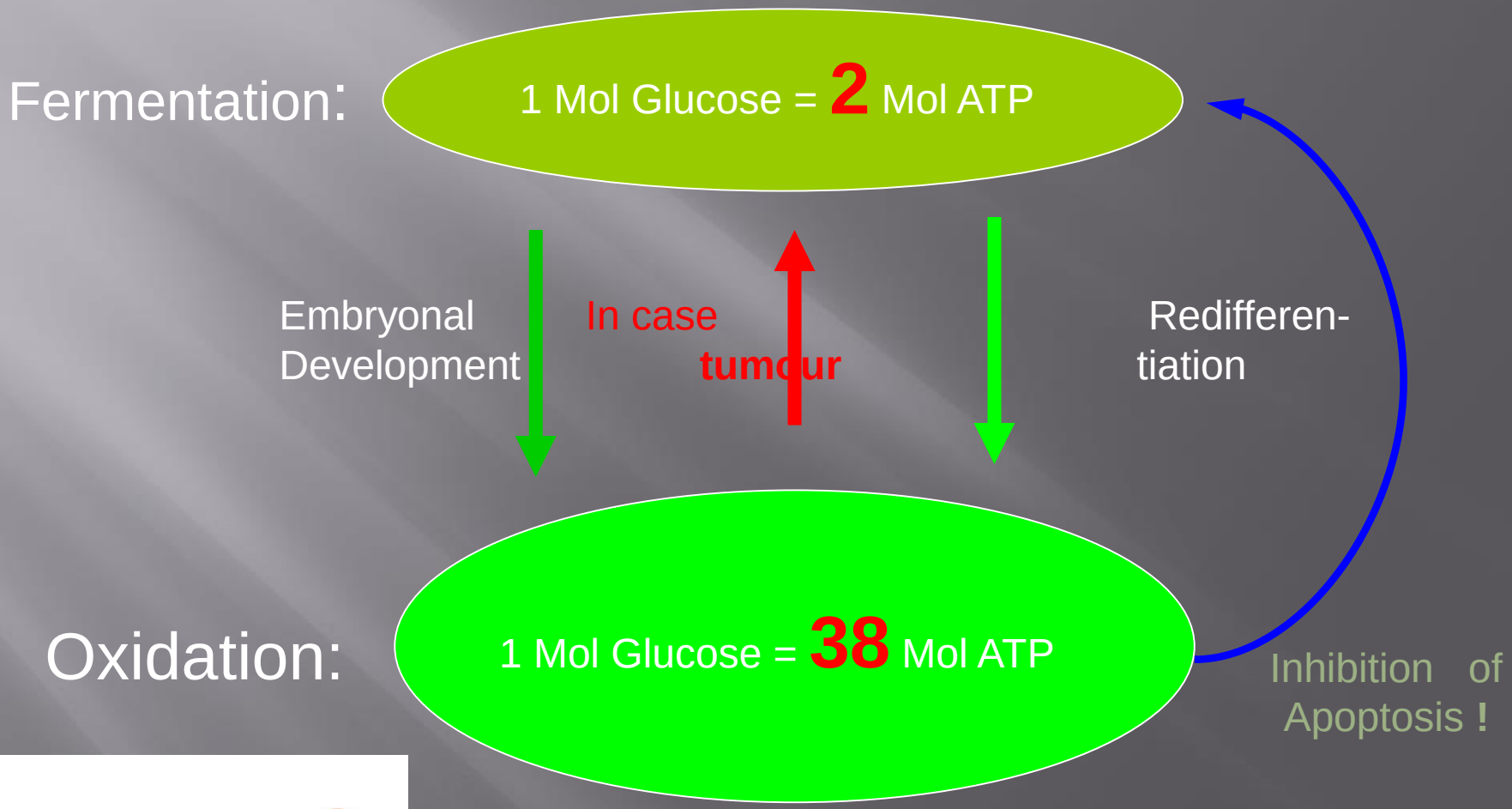
The Emperor

- Cancer is part of our genetic inheritance – we will always have cancer amidst us, within us, amongst us
- Cancer is not one disease, it's many. But each of them begins in the same way – with the uncontrolled growth of a single cell
- It attacks the blood, the breasts, the lungs, and every other part of the body
- No one is immune to cancer, neither young nor old, rich nor poor, frail nor strong

Cancer facts



Evolution and Energy metabolism



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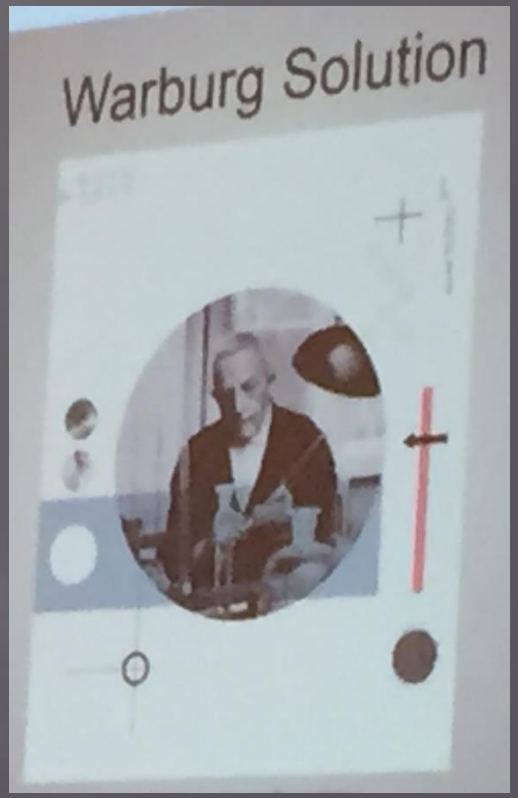
ISLA Congress 2016

- Malignant tumors depend on glucose
- Malignant tumors only do anaerobe glycolysis



Q Chi

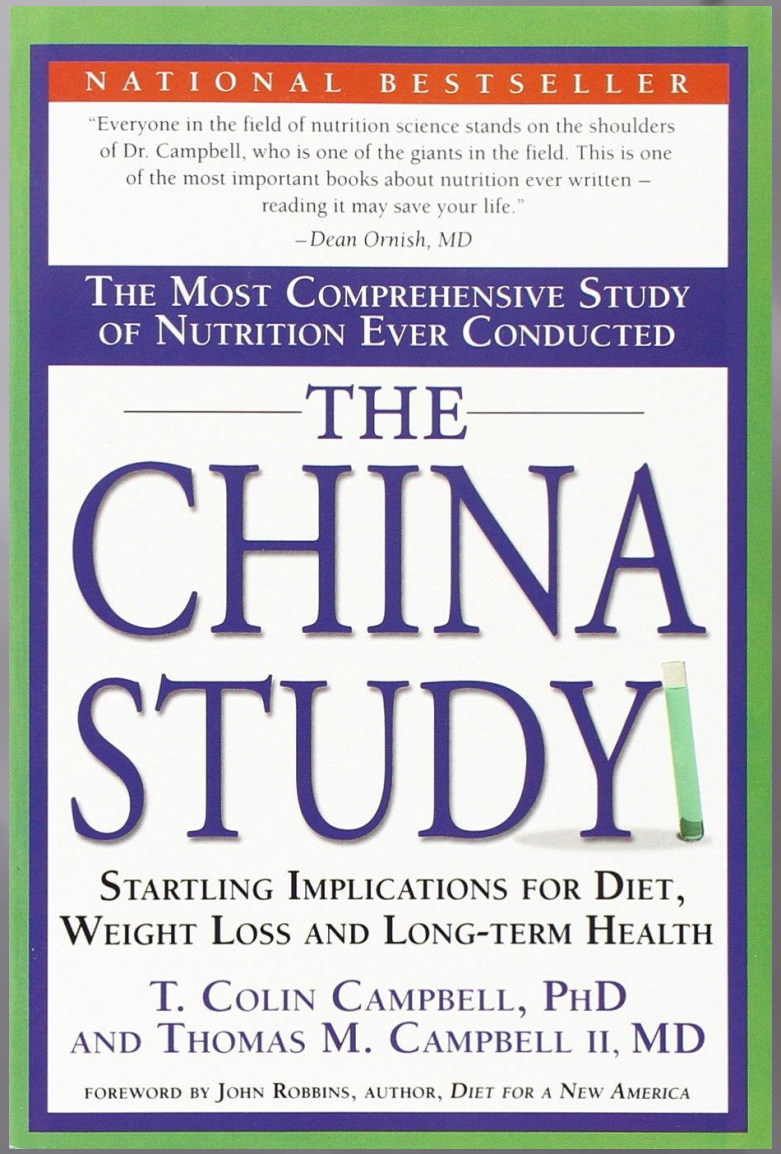
An Integrative Approach to Treat Cancer

- "4-P" Integrative Cancer Prevention Program –
  1) ***P***lant-based Nutrition Therapy
  2) ***P***atient-based Mitochondrial Supplements
  2) ***P***hysical Exercise Therapy
  3) ***P***sychosomatic Therapy
- "5-P" Integrative Immune Restoration Program –
  "4-P" and ***P***hoto-Intravenous Therapy
  or Photo-Sublingual Therapy
- "6-P" Integrative Cancer Treatment Program –
  "5-P" and ***P***hotodynamic Therapy

Plant-based Nutrition Therapy – Don't Kill the Messenger

- ***Zero*** animal proteins and plant-based diet is recommended as a nutritional therapy for cancer patients
- A "high-protein" diet was defined in the research as deriving at least 20 per cent of daily calories from animal protein
- "***High-protein Diet Could be as Dangerous as Smoking 20 cigarettes a day***." – a study published on March 5, 2014, by the researchers from the University of Southern California
- The study shows that high levels of dietary animal protein were associated with a fourfold increase in their risk of death from cancer compared to those on a low-protein diet

The China Study



- It's the largest comprehensive study of human nutrition ever conducted.
- It was launched via a partnership between Cornell University, Oxford University, and the Chinese Academy of Preventative Medicine.
- **880 000 000 People included**

Plant-based Nutrition Therapy

- Switch diet to vegan, no meat or dairy, like fruits, grains, beans, vegetables, unprocessed foods and plenty of probiotic (fermented) foods like sauerkraut. Discontinue the use of alcohol, tobacco, drugs, sugar, artificial sweeteners, and food dyes
- "*The China Study*" book published in 2004 by Dr. T. Colin Campbell, covers the most detailed explanation of how animal-protein promotes cancer tumor growth and plant-based protein not. A must-read book to fully understand the link of foods to cancer

Co Enzym Q10 kann die Bildung bösartiger Tumoren blockieren:

CoQ10 and malignant tumor

Tage nach Tumorinitiie-rung	in der Kontroll-gruppe	in der Q10 Gruppe
Tag 55	85 %	25 %
Tag 69	100 %	55 %
Tag 77	- -	77 %

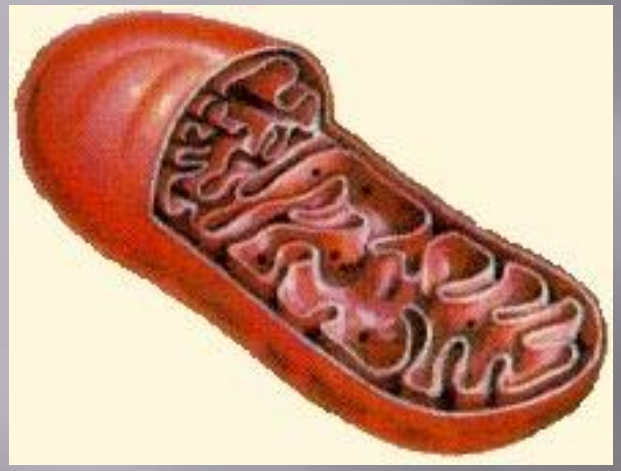
Differences and tumor size

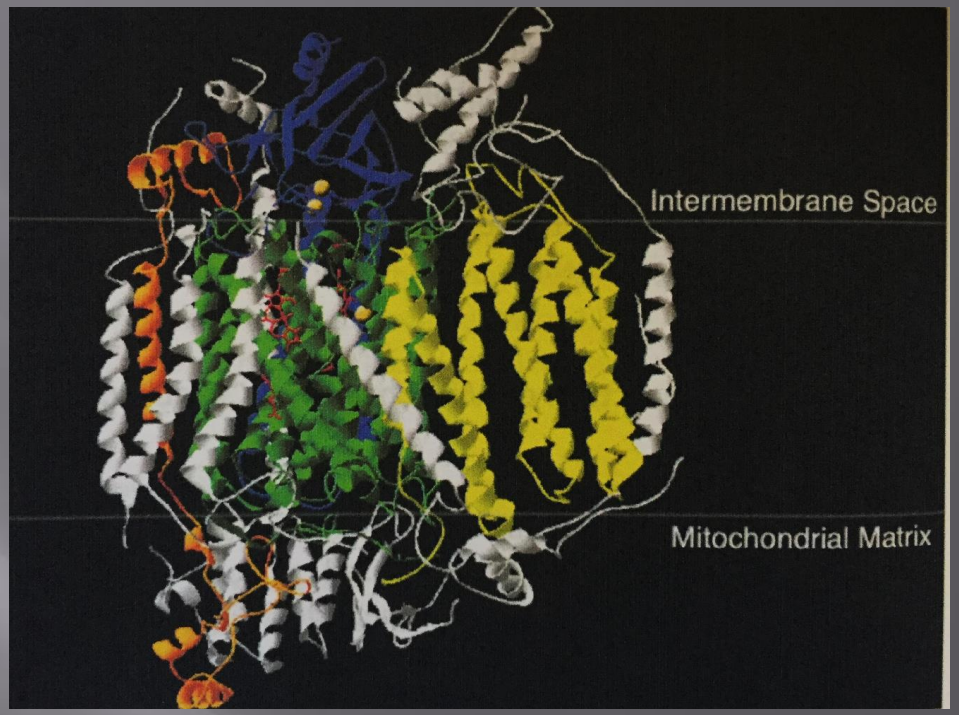
Tage nach Tumorinitiie-rung	in der Kontroll-gruppe	in der Q10 Gruppe
Tag 55	250 mm^2	95 mm^2
Tag 83	360 mm^2	170 mm^2
Tag 97	930 mm^2	580 mm^2

Differences in mortality

Tage nach Tumorinitiie-rung	in der Kontroll-gruppe	in der Q10 Gruppe
Tag 55	5 %	0 %
Tag 111	50 %	15 %
Tag 132	100 %	- -
Tag 300	- -	20 %

OxPhos





Tab. 1. Enzymkomplexe der Atmungskette (Elektronentransportkette und oxidative Phosphorylierung)

Enzym-komplex	Alternative Bezeichnung(en)	Coenzyme und Cofaktoren	Kodierende mtDNS-Gene
Komplex I	NADH-Dehydrogenase-Ubichinon-Oxidase, NADH-Dehydrogenase	Coenzym Q_{10}, Riboflavin, Niacin, 3 Eisen-Schwefel-Zentren, NADH, $FADH_2$	7
Komplex II	Succinat-Dehydrogenase-Ubichinon-Oxidoreduktase	Coenzym Q_{10}, Riboflavin, 3 Eisen-Schwefel-Zentren, $FADH_2$	0
Komplex III	Ubichinon-Cytochrom-c-Oxidoreduktase, Ubichinol-Cytochrom-c-Reduktase	Coenzym Q_{10}, 1 Eisen-Schwefel-Zentrum	1
Komplex IV	Cytochrom-c-Oxidase	Vitamin C, Kupfer	3
Komplex V	ATP-Synthase	Magnesium	2

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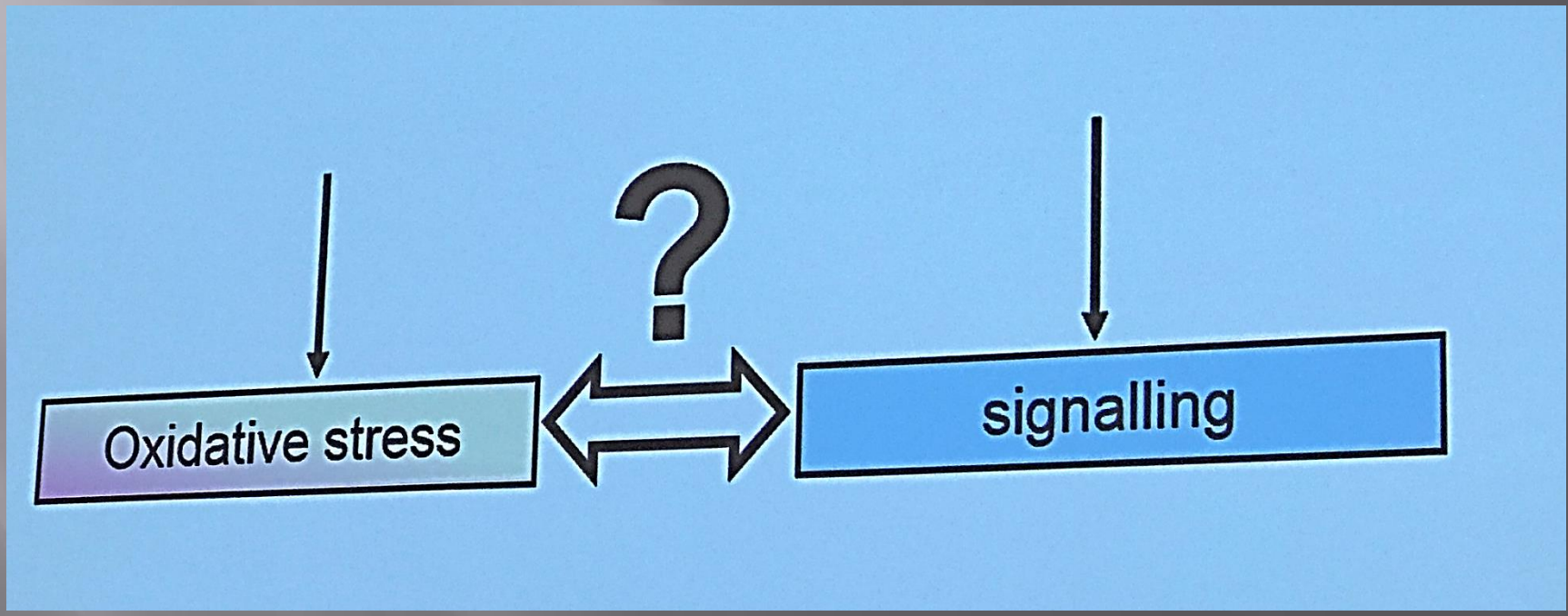
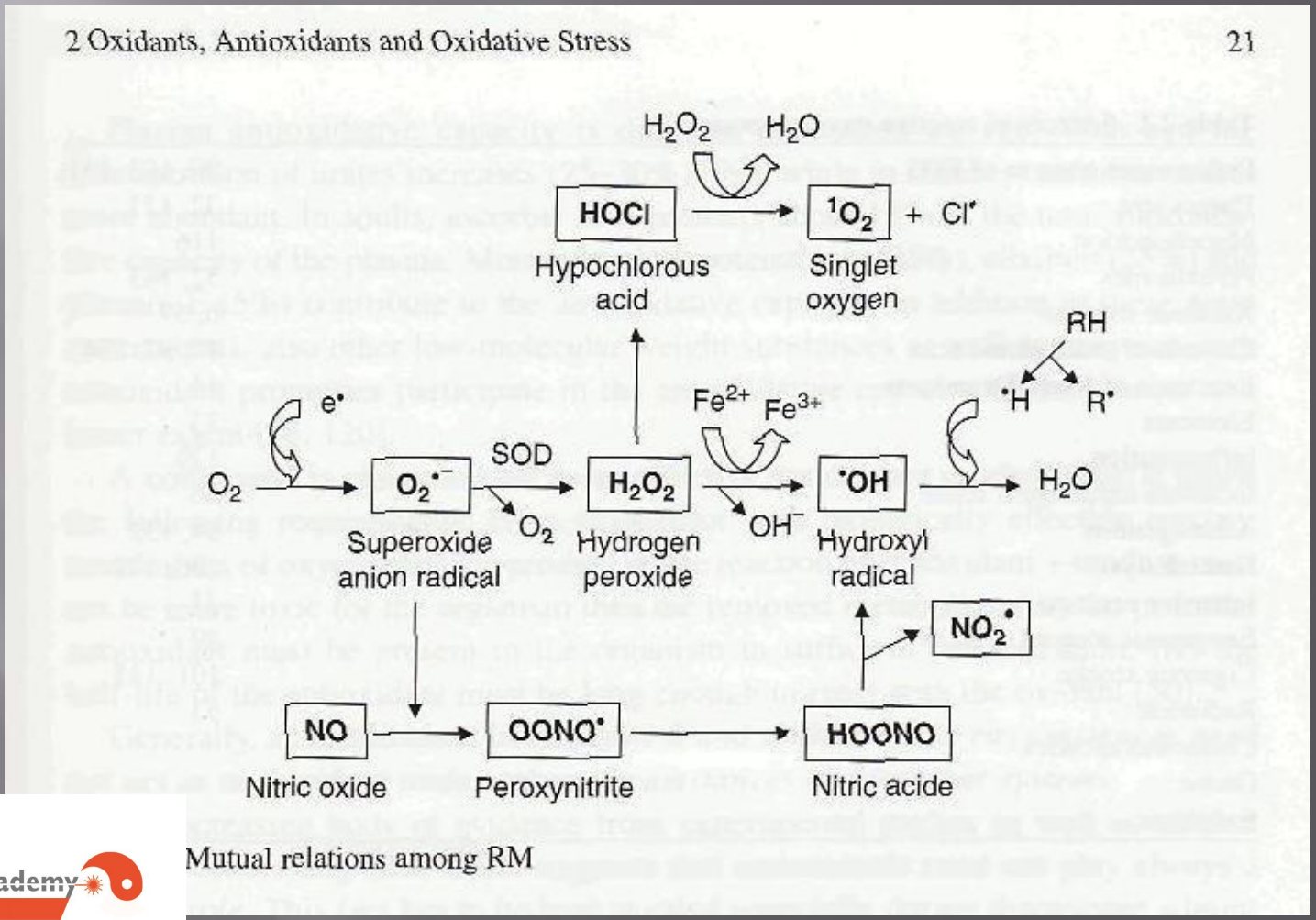
What is the predominant mechanism of mitochondrial ROS action?



Acquired Mitochondriopathy



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Super**o**xid- **D**ismutase (SOD) neutralisiert $O_2^{\bullet -}$

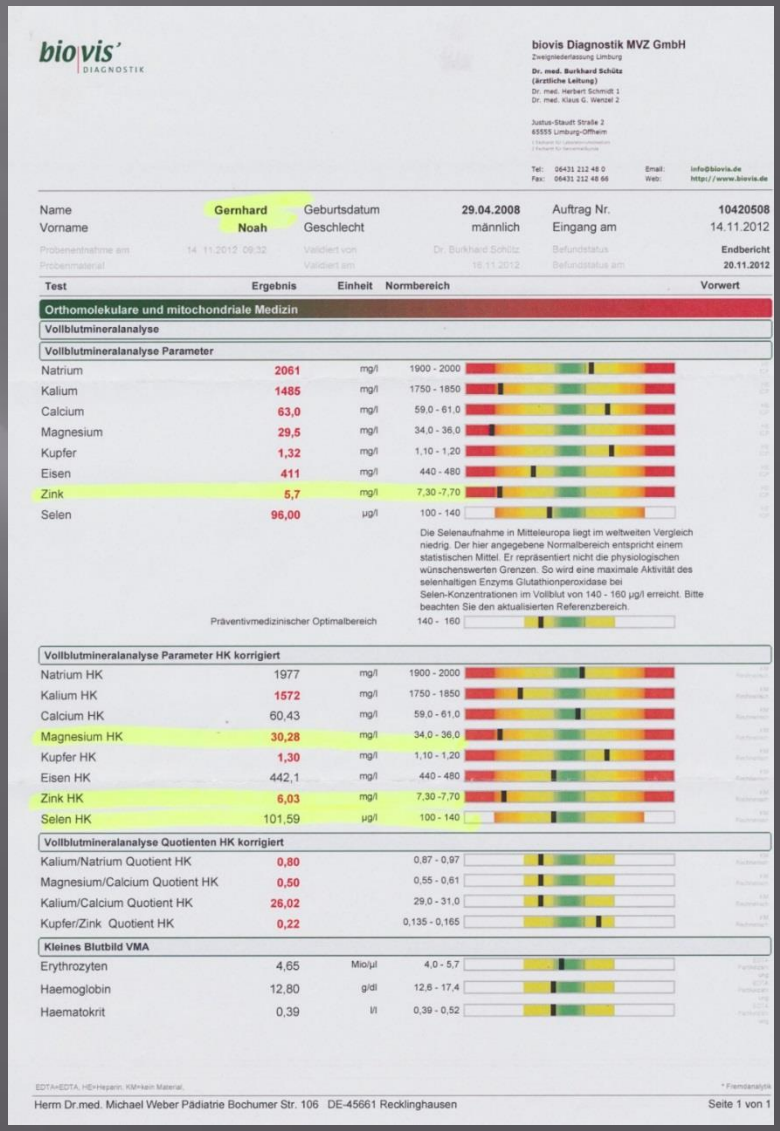
Mitochondrial SOD contains Mangan

Cell-SOD contains Zinc and Copper

CoEnzyme Q10
Quinon and Quinol have a high Affinity towards Superoxide $O_2^{\bullet -}$

MitoMed: Diagnostic I

- History !!!!!!
- Urine analysis
- **Whole blood** mineral analyse
- Vitamin – Status
- Mitochondrial Activity
- ATP
- Stool analysis
- NO - expiration



bio vis DIAGNOSTIK

biovis Diagnostik MVZ GmbH
Zweigniederlassung Limburg
Dr. med. Burkhard Schütz (ärztliche Leitung)
Dr. med. Herbert Schmidt 1
Dr. med. Klaus G. Wenzel 2

Justus-Staudt Straße 2
65555 Limburg-Offheim
Tel: 06431 212 48 0 Email: info@biovis.de
Fax: 06431 212 48 66 Web: http://www.biovis.de

Name	Gernhard	Geburtsdatum	29.04.2008	Auftrag Nr.	10420508
Vorname	Noah	Geschlecht	männlich	Eingang am	14.11.2012
Probenentnahme am	14.11.2012 09:32	Validiert von	Dr. Burkhard Schütz	Befundstatus	Endbericht
Probenmaterial		Validiert am	16.11.2012	Befundstatus am	20.11.2012

Test	Ergebnis	Einheit	Normbereich	Vorwert
Orthomolekulare und mitochondriale Medizin				
Vollblutmineralanalyse				
Vollblutmineralanalyse Parameter				
Natrium	2061	mg/l	1900 - 2000	
Kalium	1485	mg/l	1750 - 1850	
Calcium	63,0	mg/l	59,0 - 61,0	
Magnesium	29,5	mg/l	34,0 - 36,0	
Kupfer	1,32	mg/l	1,10 - 1,20	
Eisen	411	mg/l	440 - 480	
Zink	5,7	mg/l	7,30 -7,70	
Selen	96,00	µg/l	100 - 140	
			Die Selenaufnahme in Mitteleuropa liegt im weltweiten Vergleich niedrig. Der hier angegebene Normalbereich entspricht einem statistischen Mittel. Er repräsentiert nicht die physiologischen wünschenswerten Grenzen. So wird eine maximale Aktivität des selenhaltigen Enzyms Glutathionperoxidase bei Selen-Konzentrationen im Vollblut von 140 - 160 µg/l erreicht. Bitte beachten Sie den aktualisierten Referenzbereich.	
Präventivmedizinischer Optimalbereich			140 - 160	
Vollblutmineralanalyse Parameter HK korrigiert				
Natrium HK	1977	mg/l	1900 - 2000	
Kalium HK	1572	mg/l	1750 - 1850	
Calcium HK	60,43	mg/l	59,0 - 61,0	
Magnesium HK	30,28	mg/l	34,0 - 36,0	
Kupfer HK	1,30	mg/l	1,10 - 1,20	
Eisen HK	442,1	mg/l	440 - 480	
Zink HK	6,03	mg/l	7,30 -7,70	
Selen HK	101,59	µg/l	100 - 140	
Vollblutmineralanalyse Quotienten HK korrigiert				
Kalium/Natrium Quotient HK	0,80		0,87 - 0,97	
Magnesium/Calcium Quotient HK	0,50		0,55 - 0,61	
Kalium/Calcium Quotient HK	26,02		29,0 - 31,0	
Kupfer/Zink Quotient HK	0,22		0,135 - 0,165	
Kleines Blutbild VMA				
Erythrozyten	4,65	Mio/µl	4,0 - 5,7	
Haemoglobin	12,80	g/dl	12,6 - 17,4	
Haematokrit	0,39	l/l	0,39 - 0,52	

EDTA=EDTA, HE=Heparin, KM=kein Material. * Fremdanalytik

Herm Dr.med. Michael Weber Pädiatrie Bochumer Str. 106 DE-45661 Recklinghausen Seite 1 von 1

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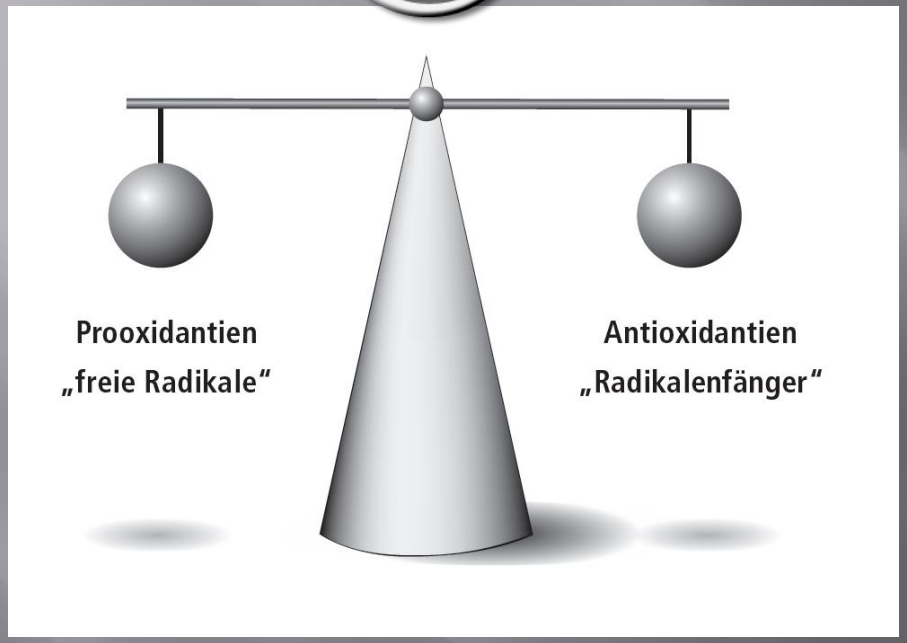
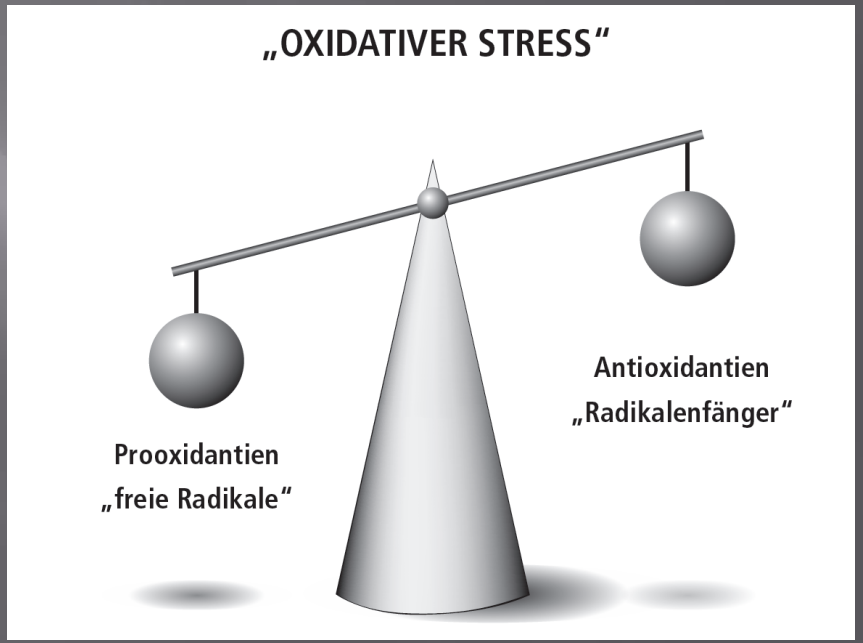
LLLT and Mitochondrial Function





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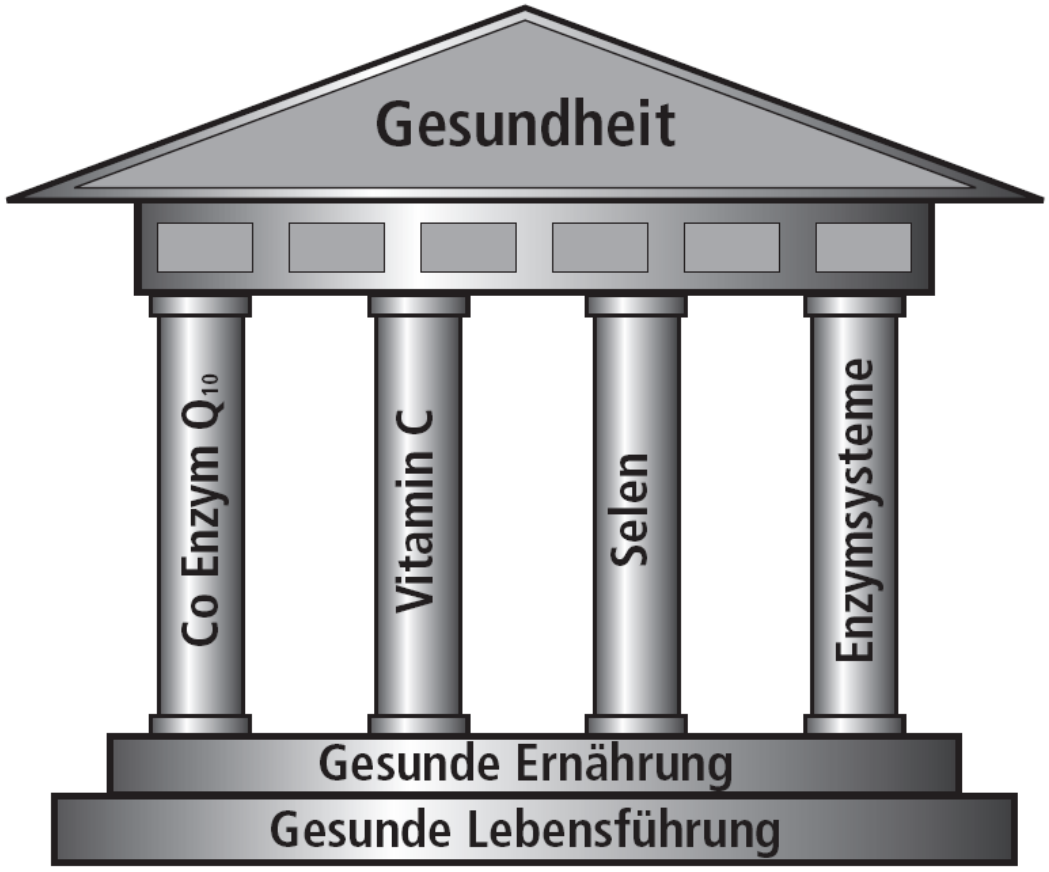
LLLT and Mitochondrial Function



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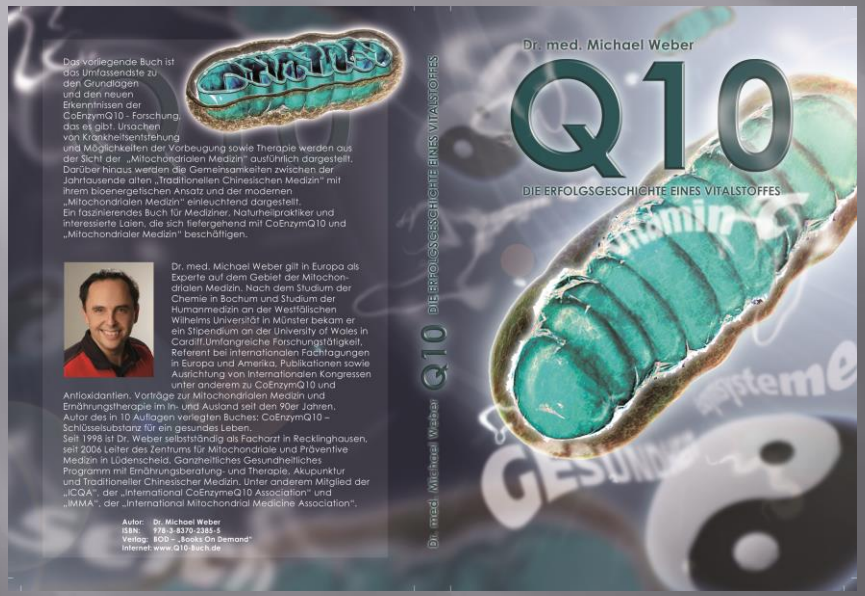
Vitamin C – Functions I

- Ascorbic Acid
- Water-soluble antioxidant / Free Radical Scavenger
- Prevents lipid – peroxidation
- Protects proteins
- Protects cell – membranes
- Regenerates Vitamin E

Co – Enzyme Q10

- A key substance for healthy living -



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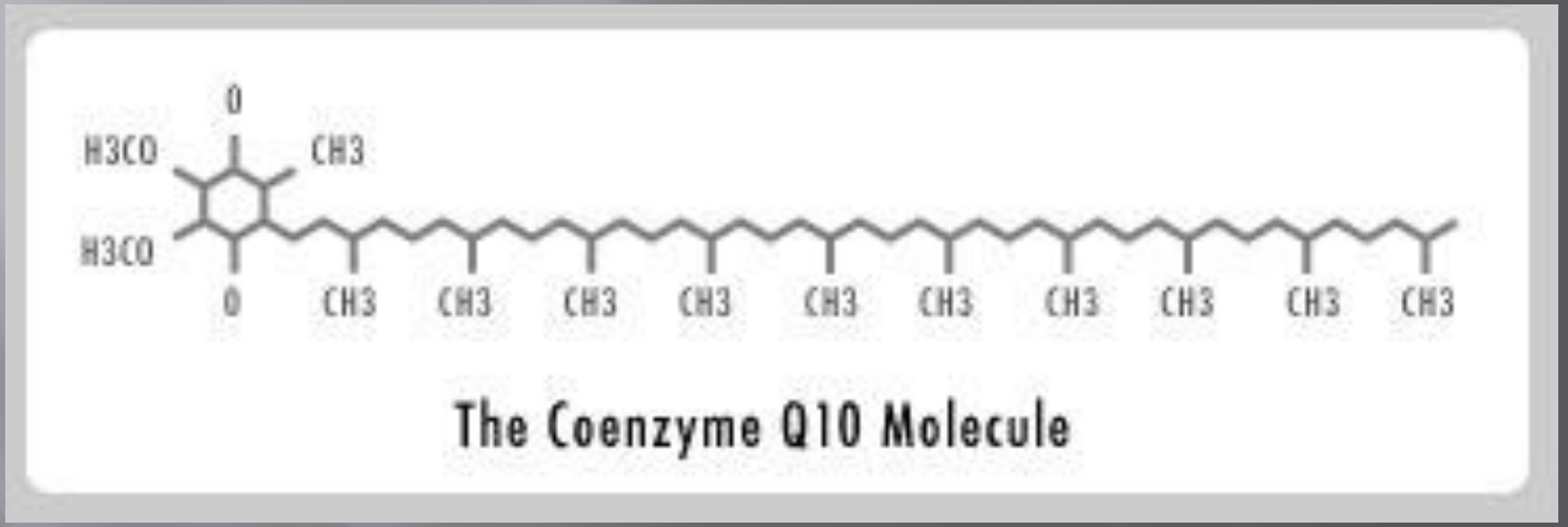
Ubiquinon : Co Enzym Q10



The Coenzyme Q10 Molecule

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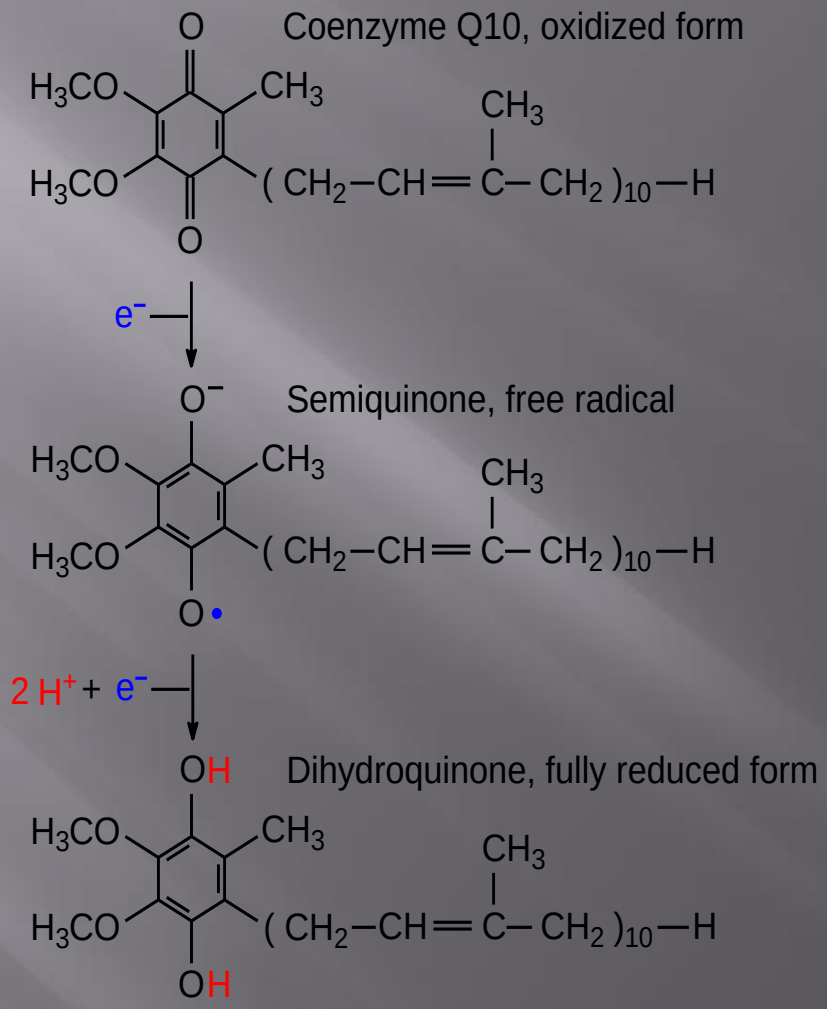
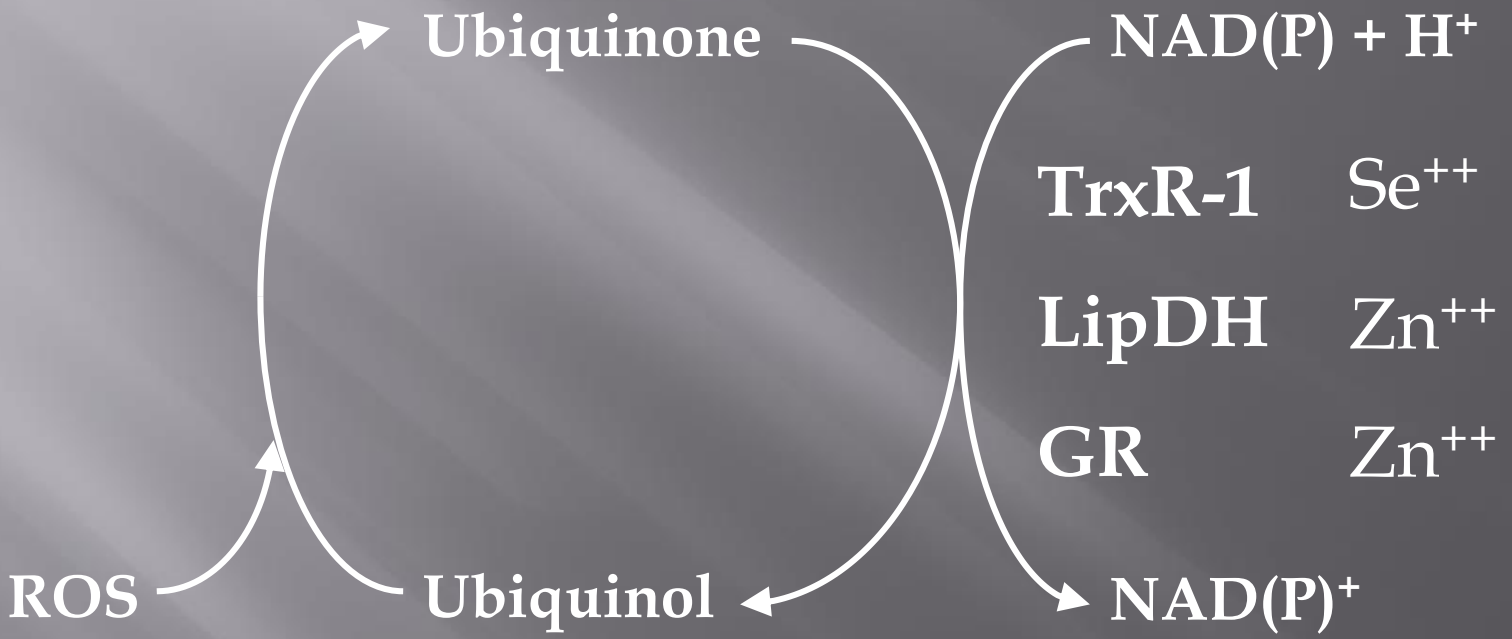


Oxidized, partially and fully reduced state of coenzyme Q10

Schmid D. and Zülli F: Mutations in Mitochondrial DNA as Principal Ageing Factor, Mibelle 2006

Regeneration of the antioxidant ubiquinol



TrxR-1 = Thioredoxin reductase
LipDH = Lipoamide dehydrogenase
GR = Glutathione reductase

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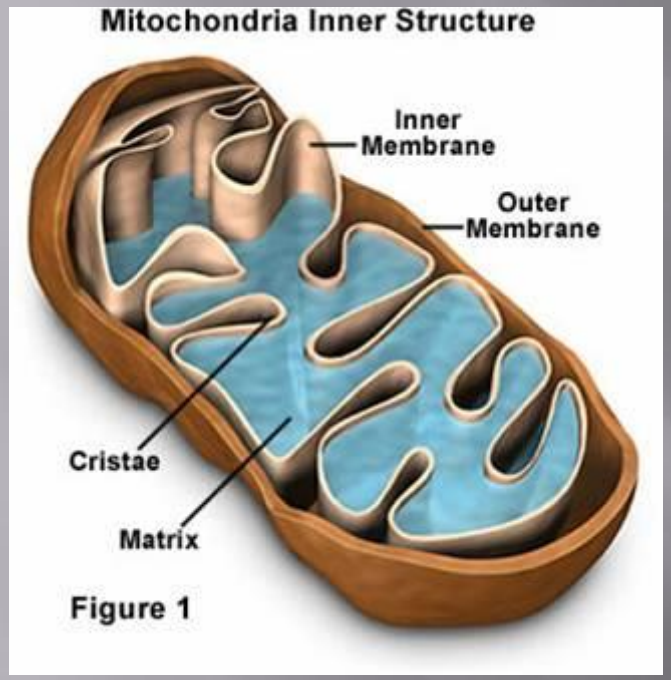
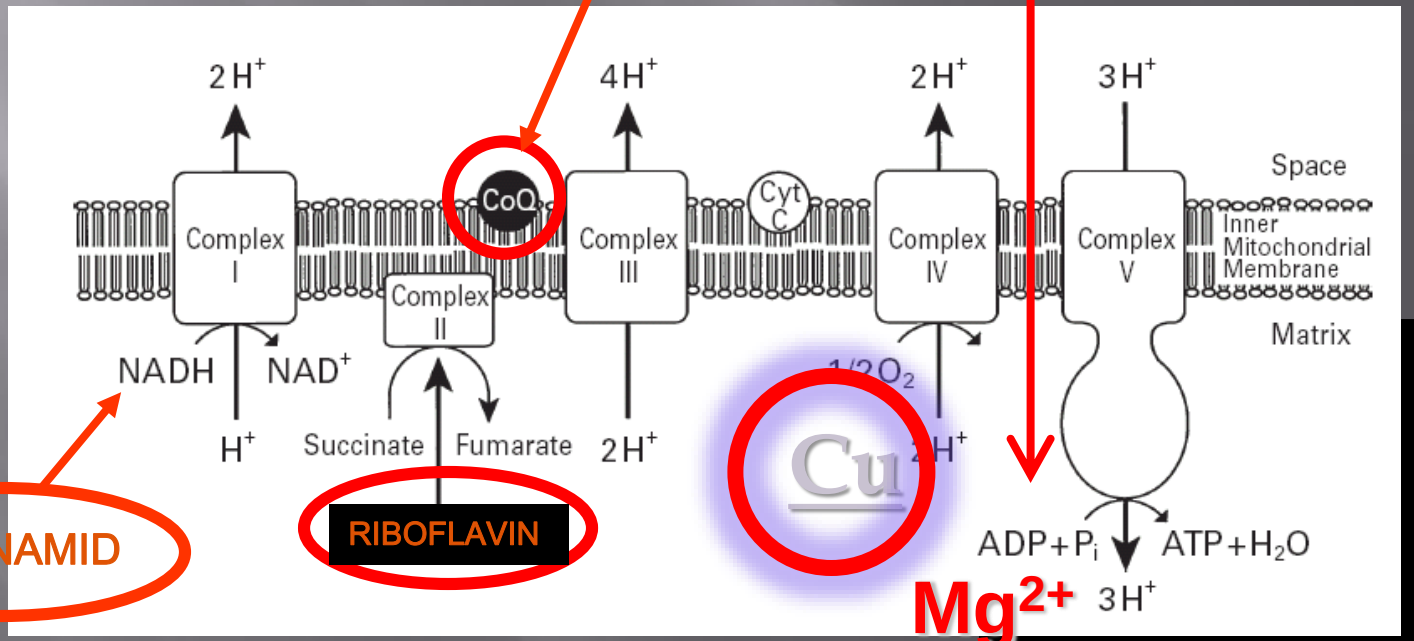
Magnesium



UBIQUINON



NIACINAMID

RIBOFLAVIN

COPPER: Physiological Therapy of mitochondrial Dysfunctions

- Complex IV (Cytochrome-c-Oxidase) der mitochondrial respiratory chain
- Electron transport
- Oxidative Phosphorylation („OxPhos“)
- ATP – Production
- **Chromophore for Redlight – and NIR - LLLT**

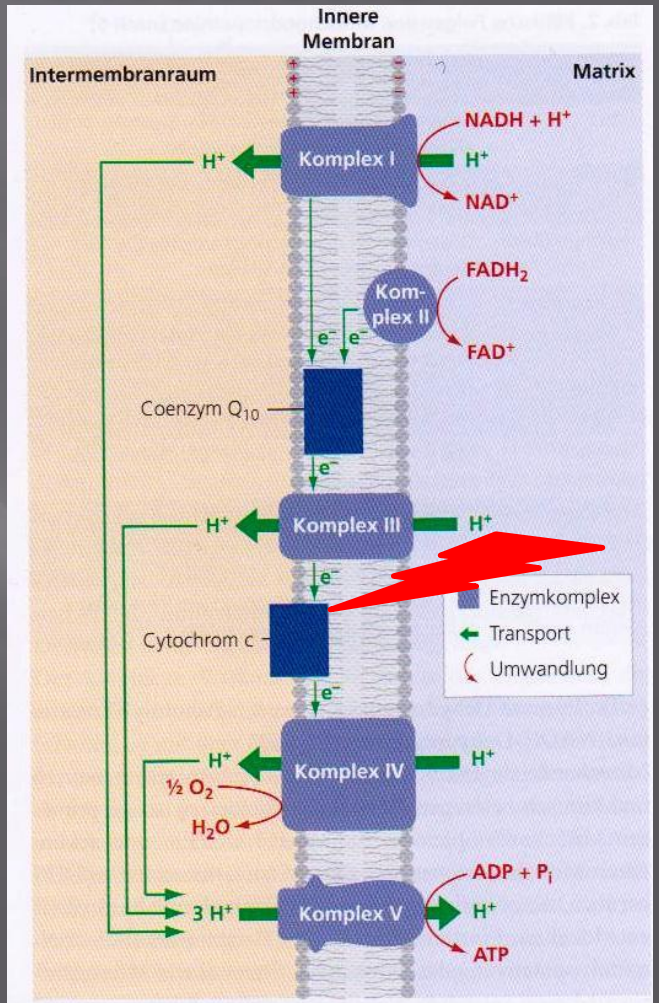


Abb. 2. Vereinfachtes Schema der Elektronentransportkette und der oxidativen Phosphorylierung in der Mitochondrienmembran

Copper - Functions

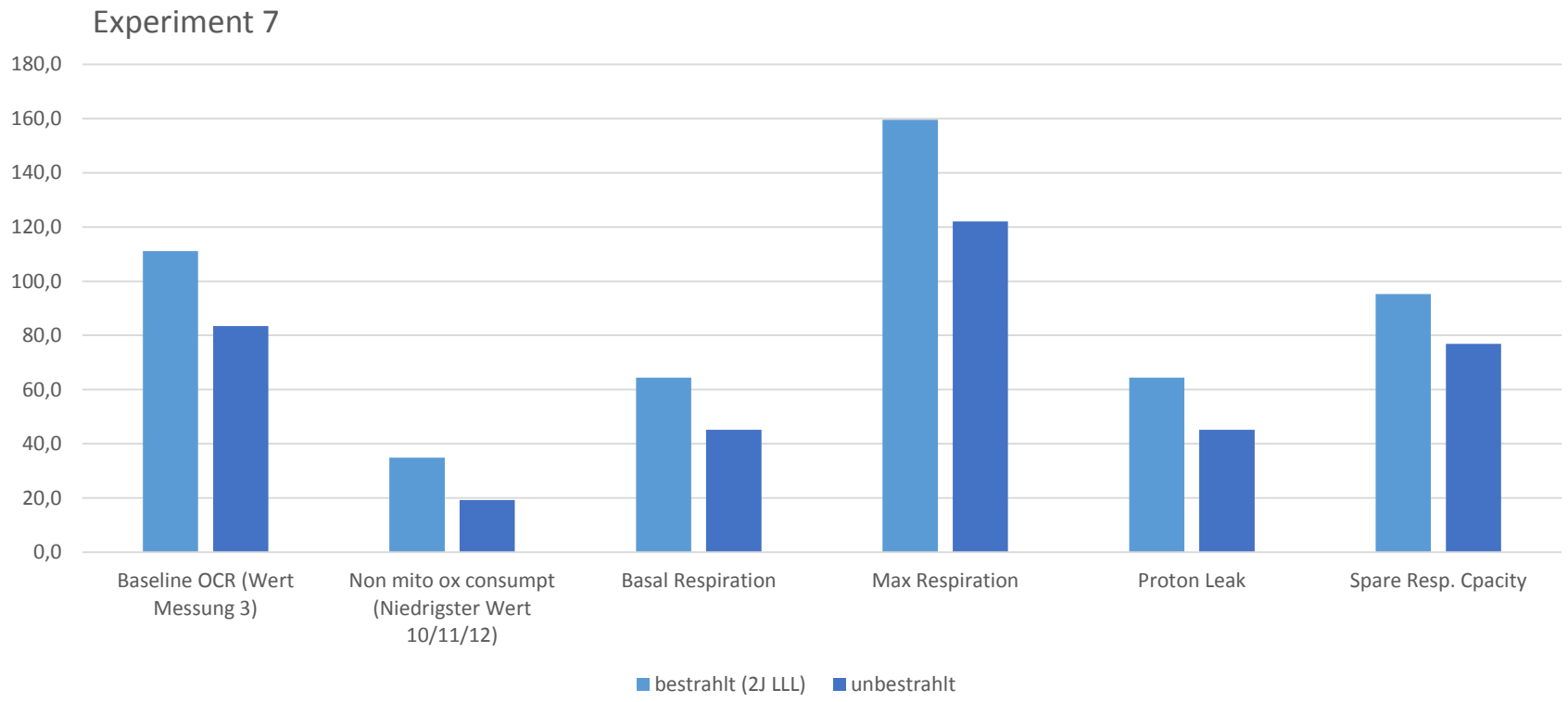
- Copper is a central building material for the energy generation in our cells
- Copper plays an important role in iron metabolism
- Copper can prevent certain forms of blood deficiency
- Copper is required for the detoxification of free radicals
- **Copper is required for connective tissue**
- Copper is important for hormone metabolism
- **Copper is necessary for skin pigmentation**
- Copper is required by the nervous system
- **Copper is a component of collagen**
- **Copper is built into bone and cartilage**
- Copper is involved in the degradation of uric acid
- Copper protects fat protein particles
- Copper is recommended for osteoporosis
- **Copper is involved in the relaxation of blood vessels**
- **Copper helps to protect our cells from oxidative stress**
- **COPPER IS MAIN TARGET FOR LLLT (RED / INFRARED)**

Q Chi

Prof. Dr. Jörg Bergemann; Universität Siegmaringen
Dr. Michael Weber; European TCM Laser Academy

Humane Fibroblasten, Radiation with 2J

810nm



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AG-TCM Rothenburg Kongress
May 8th – May 12, 2018

欢迎

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Rothenburg o. d. T.

ISLA International

13. Internationaler ISLA-Kongress für medizinische Laseranwendungen

International Society for Medical Laser Applications (ISLA e.V.)

08. - 09. Juni 2018

Ort: Fleming's Conference Hotel Frankfurt am Main

Kongresssprache: Deutsch & Englisch (Simultanübersetzung)

- Mehr als 20 hochkarätige Vorträge aus den Bereichen:
  - Medizinische Lasertherapie
  - Schmerztherapie
  - Regenerative Medizin
  - Lasernadelakupunktur
  - Intravenöse Lasertherapie
  - Interstitielle/Intra-artikuläre Lasertherapie
  - PRP und Laser
  - Transkranielle Lasertherapie
  - Photodynamische Tumortherapie
  - Sonodynamische Tumortherapie
  - Stammzellen und Laser
  - Immuntherapie
- Referenten und Teilnehmer aus über 25 Ländern (Simultanübersetzung)
- Zahlreiche Workshops, Live-Demos und Diskussionsrunden
- Ausgewählte Aussteller
- Attraktives Rahmenprogramm

Optionales Zusatzangebot

- 7. Juni: Vorkurs: Grundlagen der medizinischen Lasertherapie

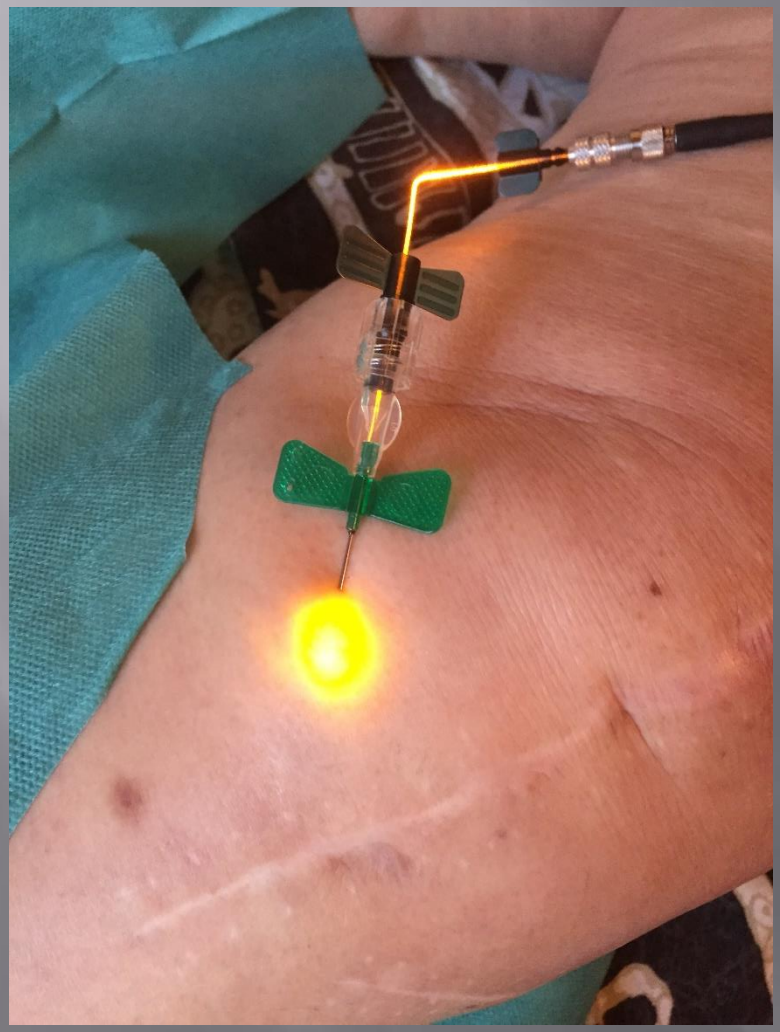
Weitere Informationen folgen in Kürze

ISLA
International Society for Medical Laser Applications

International Society for Medical Laser Applications
Lönsstraße 10, 37697 Lauenförde
Tel.: +49 / 5273 / 36778 - 0, Fax: +49 / 5273 / 36778 - 19
Email: info@isla-laser.org

European Laseracademy

June 29th and June 30th, 2018



Welcome Remarks Day Two

Recent research: Summary of International Meetings

Enhancement of LLLT by Micronutrients I

LLL Therapy and Respiratory Chain

Complex I Vitamin B3 (NAD / NADH)

Complex III CoEnzyme Q10 (Ubiquinol)

Protocols

Enhancement of LLLT by Micronutrients II

Copper

Complex IV Cytochrome C - Oxidase

Complex V Magnesium

Important Micronutrients

Diagnostic

Vitamin B12

Vitamin D3

Vitamin C

Protocols

LLLT and TCM

„In all cultures and medical traditiones prior to our time healing was avieved by moving of energy!“

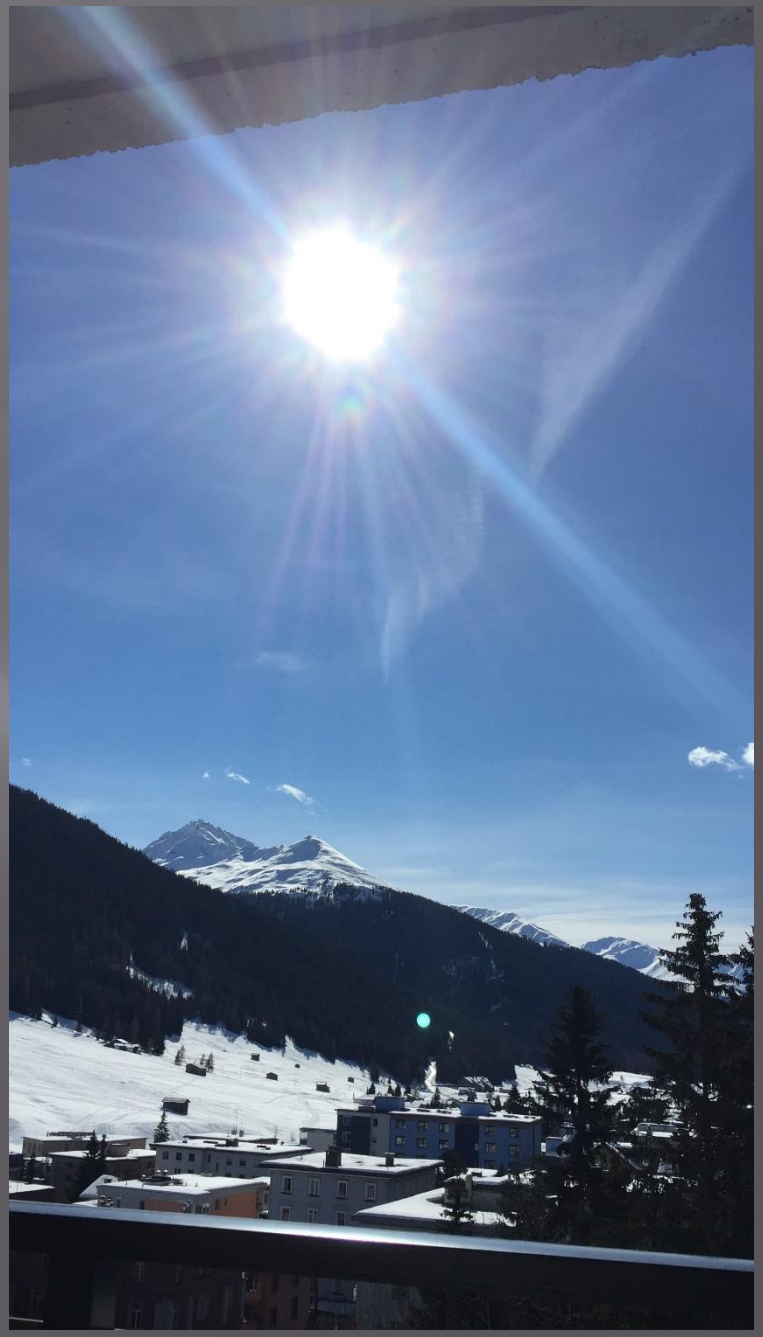
Albert Szent-Györgyi

1960

Nobelpricewinner

Discoverer of Vitamin C

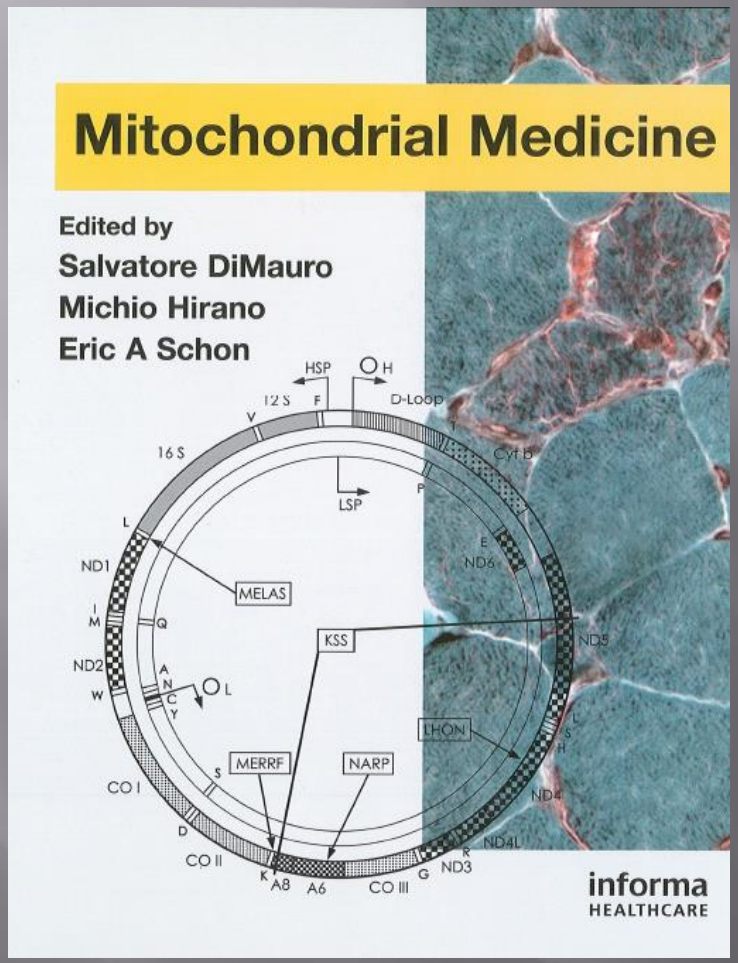
Light can heal

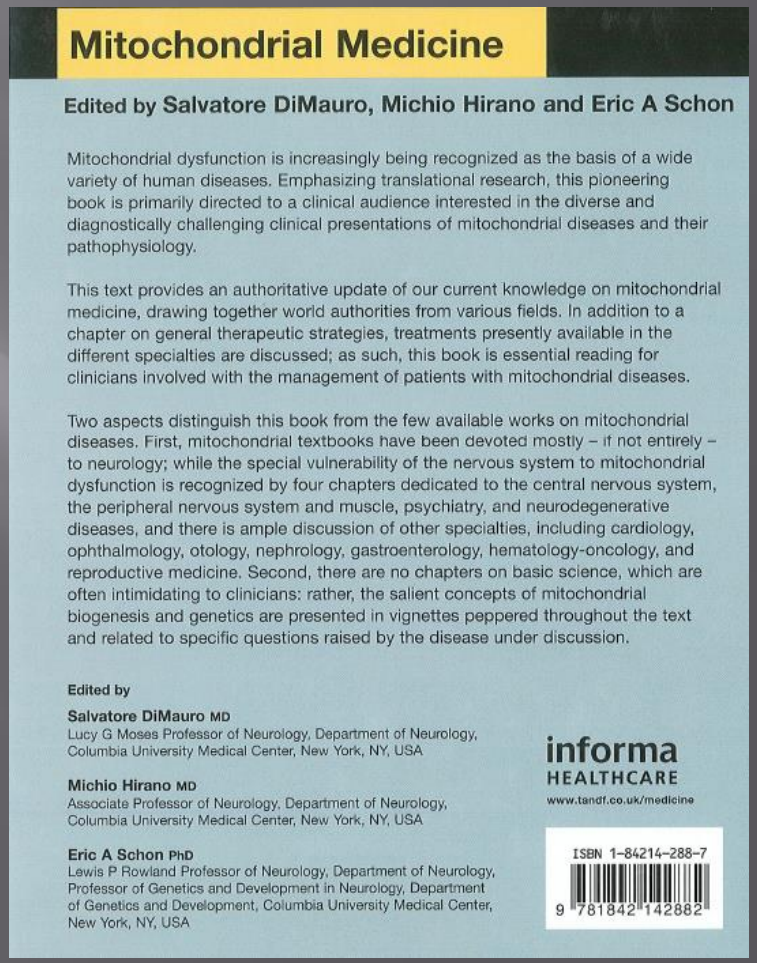


European Laser Academy
歐洲激光學院

Let the Mitochondria shine to the benefit of your patients!

Literatur I
Mitochondriale Medizin





Literatur II
Mitochondriale Medizin