Michael H. Weber

New Methods and Laser Technology in Photodynamic Cancer Therapy
Photodynamic therapy (PDT)

- 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 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.
- The basic principle behind this mechanism is the development of radical oxygen species.
Photodynamic therapy (PDT)

- However up to today PDT was limited to cancer treatment of superficial tumors
- Because we are not able to bring the laser beam in a sufficient concentration deeper into the body.
Introduction: Process of Photodynamic Therapy

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

- Photosensitizing agent
- Light of specific wavelength

Photodynamic Therapy

Diagram: The diagram illustrates the photodynamic process involving a porphyrin sensitizer and oxygen. The diagram shows the following steps:

1. Excitation of the sensitizer to the singlet state ($^1P_x$).
2. Intersystem crossing to the triplet state ($^3P_x$).
3. Fluorescence emission.
4. Phosphorescence emission.
5. Interaction with oxygen ($^1O_2$) leading to the formation of a singlet oxygen ($^1O_2$).
Mechanisms of PDT
Mechanisms of PDT

- Selective targeting of tumor cells
- Minimal side effects
- No resistance after repeated treatments
- Tumor vascular shutdown by thrombosis and haemorrhages
- Induction of local inflammation
- Immune activation
The photodynamic reaction

Light distribution and cellular response during PDT
Immunological effects of PDT

[Diagram showing the effects of photodynamic therapy (PDT) on cancer cells, including the production of reactive oxygen species (ROS), and the immune response involving phagocytosis, DAMPs, and cytokines like IL-6, IL-1β, TNFα, and IL-8.]
Photosensitizers
Traditional Photosensitizers
(porphyrin derived)

- Haematoporphyrins, HpD
  - Derivatives of Haem
  (Photofrine and others)
- Chlorines
  - Derivatives of Chlorophyll
- Porphycenes
  - Synthetic Porphyrines
### Table 1  Currently available photosensitizers.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Drug</th>
<th>Substance</th>
<th>Manufacturer</th>
<th>Web site</th>
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<tr>
<td>Porphyrin</td>
<td>Photofrin®</td>
<td>HpD</td>
<td>Axcan Pharma, Inc.</td>
<td><a href="http://www.axcan.com">www.axcan.com</a></td>
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<td>Porphyrin</td>
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<td>ALA</td>
<td>DUSA Pharmaceuticals, Inc.</td>
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<td>Porphyrin</td>
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<td>M-ALA</td>
<td>Photocure ASA</td>
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<tr>
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<td>Vertiporfin</td>
<td>Novartis Pharmaceuticals</td>
<td><a href="http://www.visudyne.com">www.visudyne.com</a></td>
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<tr>
<td>Texaphyrin</td>
<td>Antrin®</td>
<td>Lutexaphyrin</td>
<td>Pharmacyclics</td>
<td><a href="http://www.pharmacyclics.com">www.pharmacyclics.com</a></td>
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<tr>
<td>Chlorin</td>
<td>Foscan®</td>
<td>Temoporfin</td>
<td>Biolitec Pharma Ltd.</td>
<td><a href="http://www.bioletcpharma.com">www.bioletcpharma.com</a></td>
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<tr>
<td>Chlorin</td>
<td>LS11</td>
<td>Talaporfin</td>
<td>Light Science</td>
<td><a href="http://www.lightsciences.com">www.lightsciences.com</a></td>
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<tr>
<td>Chlorin</td>
<td>Photochlor</td>
<td>HPPH</td>
<td>RPCI</td>
<td><a href="http://www.roswellpark.org">www.roswellpark.org</a></td>
</tr>
<tr>
<td>Dye</td>
<td>Photosens®</td>
<td>Phthalocyanine</td>
<td>General Physics Institute</td>
<td><a href="http://www.gpi.ru">www.gpi.ru</a></td>
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### Photodynamic Therapy

**Treatment indications (all superficial)**

<table>
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<tr>
<th>Photosensitizer</th>
<th>Type of diseases</th>
<th>Country</th>
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<tbody>
<tr>
<td>(5-ALA)</td>
<td>Actinic keratosis, Basal cell carcinoma</td>
<td>U.S., EU</td>
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<tr>
<td>5-aminolevulinate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photofrin</td>
<td>Barrett’s dysplasia</td>
<td>U.S., Canada, EU, UK</td>
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<tr>
<td>Photofrin</td>
<td>Cervical cancer</td>
<td>Japan</td>
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<tr>
<td>Photofrin</td>
<td>Endobronchial cancer</td>
<td>Canada, Most EU Countries, Japan, U.S.</td>
</tr>
<tr>
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<td>Canada, Most EU Countries, Japan, U.S.</td>
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<tr>
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<td>Papillary bladder cancer</td>
<td>Canada</td>
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<td>Foscan</td>
<td>Head and neck cancer</td>
<td>EU, Norway, Iceland</td>
</tr>
<tr>
<td>Verteporfin</td>
<td>Age-related Macular Degeneration</td>
<td>Canada, Most EU Countries, Japan, U.S.</td>
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</table>

**Photosensitizers approved for therapy**
Photodynamic Therapy
New natural derived Photosensitizers

- Chlorin E6 (Red 660 nm)
- Indocyaninegreen liposomal (Infrared 810 nm)
- Hypericin (Yellow 589 nm)
- Curcumin (Blue 447 nm)
- Riboflavin (Blue 447 nm)
Photodynamic Therapy:  
new chemodrug derived Photosensitizers

- Doxorubicin, liposomal (447 nm, blue)
- Mitoxantrone, (yellow 589nm, red 632nm)
- Paclitaxel, (ultraviolet, 345 nm)
- Cisplatin, (ultraviolet, 345 nm)
- 5-FU, (ultraviolet, 345nm)
Topical photodynamic therapy
5-Aminolaevulinic-acid, (5-ALA Creme)

Figure 2  Molecular structure for ALA.
Photodynamic Therapy

Absorption spectrum of 5-ALA
Photodynamic diagnostics PDD

(Fluorescence diagnostic with blue laser)

Fuselage skin basal cell carcinoma in daylight

Fuselage skin basal cell carcinoma under wood light
Photodynamic therapy of actinic keratosis

Photodynamische Therapie von Basaliomen und aktinischen Keratosen
Photodynamic therapy of basal cell carcinoma
Photodynamic therapy of basal cell carcinoma
Photodynamic therapy of basal cell carcinoma

Ulcerated basal cell carcinoma before treatment

Findings after 1 treatment PDT
Systemic photodynamic therapy

Fotolone ( Chlorin E6 )

- Chlorin e6 as photosensitizer
- Indications
- current development status
Chlorin E6
(chemical properties)

- trisodium salt of the „green“ porphyrin
- high solubility in water
- Molecular formula: C\textsubscript{34}H\textsubscript{33}N\textsubscript{4}Na\textsubscript{3}O
- High stability of the lyophilized API
Production of Chlorin E6

Natural sources (algae, grass, lucerne etc.)

FDA approved, GAP

inexhaustible availability (different sources/world-market)
Production of Chlorin E6

In accordance to GMP

GAP

Extractio

n

GMP process:
- unique
- efficient
- highes purity
Absorption spectrum of Chlorin E6
1 – 15 min

PDT

Generation of singlet oxygen
24 – 48 h
- Apoptosis/Necrosis
- Elimination of Ce6 from blood
Problem of all porphyrin derived photosensitizers: limited penetration depth with red laser and tumor size.
The body shower for superficial tumors with external irradiation

Insertion of laser-needles with different wavelengths into a special shower head
External PDT of lymph metastases
Potential overdosing with skin burn
Interstitial photodynamic therapy of liver metastases
DOI 10.1007/s00330-004-2290-8

T. J. Vogl (✉) · K. Eichler · M. G. Mack
S. Zangos · C. Herzog · A. Thalhammer
K. Engelmann
Department of Diagnostic and Interventional Radiology,
University of Frankfurt,
Interstitial photodynamic therapy of liver metastases
Interstitial photodynamic therapy of liver metastases
Interstitial PDT of lymph metastases
Interstitial PDT of lymph metastases
Interstitial PDT of squamous cell carcinoma
Mouth bottom cancer with lymph nodes
Larynx cancer, spreading in the neck
Larynx cancer
Larynx cancer
Interstitial laser therapy of neck lymph nodes
Interstitial PDT for neck lymph nodes
Interstitial PDT for thyroid cancer
Interstitial PDT of breast cancer with mediastinal lymph metastases
Interstitial PDT of breast cancer with mediastinal lymph metastases
Interstital therapy for mediastinal metastases
Lung cancer (needles on pleura)
Interstitial PDT of breast cancer
Interstitial breast cancer treatment
Interstital PDT of breast cancer
Interstital PDT of breast cancer
Interstitial PDT of breast cancer
Interstitial PDT for pancreatic cancer
Peritoneal carcinosis
Liver metastases
PDT in Urology
PDT in urology
Fiberoptic catheter with circular irradiation (for prostate cancer)
New catheter for bladder and prostate cancer
500 mW Red laser 658 nm
Fiberoptic catheter with spheric irradiation for bladder cancer
Bladder Cancer
Bladder cancer PET 10/2014 before treatment
Bladder cancer 2/2015 after PDT
Endoscopic PDT
Endoscopic PDT
Endoscopic PDT
Endoscopic PDT
The big problems of red laser photosensitizers still remain:

- Limited succes by using red laser only
- Limited penetration depth (max. 2.5 cm)
- Limited tumor size: max 2.5 cm
- Burning and ulceration with overdosage
- Light sensitivity
- No good success with liver metastases
- Limited success for bone metastases
- No success in treatment of brain tumors
The solution: liposomal Indocyanine Green

- **Indocyanine Green** is a fluorescent green dye and absorbs light in the infrared range (810 nm)

- It is applied intravenously

- Indocyanine Green is an approved drug used for fluorescense diagnostics (blood flow in eyes, liver heart) even FDA approved in the USA
Indocyanine Green liposomal as a new photosensitizer

- Pure Indocyanine Green binds to plasma proteins and is removed from the body in about 30 minutes and cannot be used as photosensitizer.

- In liposomal form however it will be integrated in tumor cells and can so be used for PDT with infrared laser.
Indocyanine Green, chemical structure
Indocyanine Green, absorption spectrum
Indocyanine Green as photosensitizer

A new option for improved tumor targeting and uptake is the formulation of ICG in nanoparticles like liposomes.
Nanoparticles for transport of photosensitizers
Cellular integration of a lipophile photosensitizer
NIR fluorescence images of tumor bearing mice 24 hours after injection of (A) saline and (B) LP-ICG-C18. (C) NIR fluorescence images of the organs 24 hours after injection of LP-ICG-C18. (D) Photon count of tumor bearing mice.

Selective “Over-heating” of tumor tissue by infrared stimulated Indocyanine Green

- ICG absorbs infrared light 810 nm.
- Infrared light has the highest penetration depth in the tissue. Besides activation of the ICG with production of singlet oxygen tumor tissue will be warmed up (overheating effect) and so supports the photodynamic reaction without damage of surrounding healthy tissue.
- The combination of overheating and PDT leads to an improved reaction with „tumor melting“, 
- We can call it „Photothermodynamic therapy (PTDT)“ or „Photothermoablation“ of tumor tissue. [21]
The transition of temperature in the tumor and rectum during irradiation.


http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0122849
Antitumor effect of LP-ICG-C18 in SCCVII subcutaneous mice model.


http://journals.plos.org/plosone/article?id=info:doi/10.1371/journal.pone.0122849
Indozyanine green liposomal
Indozyanine green liposomal
Lip-ICG-PDT: Rectal Cancer
Lip-ICG-PDT: Rectal Cancer
Lip-ICG-PDT, Rectal Cancer
Lip-ICG-PDT: Rectal Cancer
Other natural photosensitizers
Hypericin as photosensitizer

St. John’s wart plant
Hypericin as photosensitizer
Hypericin as photosensitizer
Hypericin as photosensitizer in combination with yellow laser therapy
Hypericin as photosensitizer
Interstitial PDT of breast cancer
Curcumin as photosensitizer
Curcuma powder
Curcumin
Curcumin
Interstitial PDT combination after Hypericin and Curcumin
Absorption spectra of different photosensitizers

- Chlorin E 6 absorbs 660 nm red laser
- Indocyanine Green absorbs 810 nm infrared laser
- Hypericin absorbs 589 nm yellow laser
- Curcurmin absorbs 447 nm blue laser
- Riboflavin absorbs 447 nm blue laser
Cancer combination therapy

- Small single tumors are ideal for PDT treatment alone
- PDT alone is not effective in:
  - big tumors
  - widely spreading tumors
  - multiple metastases

Here we need combination of PDT with other anticancer drugs and methods.
Cancer combination therapy
Cancer combination therapies

1. Combination with traditional chemotherapy
2. Combination with light sensitive chemodrugs (using chemodrugs as photosensitizers)
3. Combination with sonodynamic therapy (using photosensitizers and chemodrugs as sonosensitizers)
3. Combination with antioxidants
4. Combination with antiangionesis inhibitors
5. Combination with Cox-2 inhibitors
6. Combination with antibodies
7. Combination with different natural compounds
8. Combination with immunotherapy
5-Fluorouracil as a Phosensitiser

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1National Institute for Lasers, Plasma and Radiation Physics, Laser Department, P. O. Box MG-36, Bucharest – Magurele;
2Central Military Hospital, Ophthalmology Clinic, Bucharest, Romania

Abstract

5-FU exhibits a high fluorescence after irradiation with UV-vis light. An enhancement of the cytostatic activity of 5-FU under UV-vis irradiation was observed on an in vivo experimental model.
The tautomeric forms of 5-FU

Figure 1. The pyrimidine ring and the two 5-FU tautomers: lactam and lactim forms.
Mitoxantron as photosensitizer

- Mitoxantron is a blue substance
- Mitoxantron is activated by yellow and red light
- Mitoxantron is a strong chemo-photosensitizer
- Is effective in multiple cancer varieties
Mitoxantron
Mitoxantron as photosensitizer
Mitoxantron stimulation (Y-cannula)
Doxorubicin (liposomal) as photosensitier

- Is widely used for many different cancers (Anthracyclin antibiotics)
- Is an orange solution and is stimulated by visible laser light
- Can be enhanced by liposomal delivery (Doxil)
- Stimulation by blue-green light
Doxorubicin liposomal
Doxorubicin (liposomal) as photosensitizer
Doxorubicin stimulation
Case report: ovarian cancer with peritoneal carcinosis (patient 45 y.)

- **First check: 19.03.13:** CA 125: 88.4 + ascites in Ultrasound
- **02.04.13: 1. PET-CT Scan:** Ovarial cancer, peritoneal carcinosis, ascites
- **18.06.13: 2. PET-CT Untersuchung:** Metastasen in pelvis, metastases perihepatic, ascites
- **12.11.13: 1. MRI Abdomen:** peritoneal carcinosis, metastases subphrenic, liver and right kidney, ascites
- **08.01.15: 2. MRI pelvis:** Cervix carcinoma grade I, ascites, nodular peritoneal carcinosis, no lymph nodes or metastases in bones
- **27.08.15: 3. PET-MR scan:** proregdient peritoneal metastases, perihepatic and in pelvis, 2 new big tumors in ovarian area both sides, recurrence of the ovarian cancer, lymphh nodes rechts epiphrenic
Case report: ovarian cancer with peritoneal carcinosis
Case report: ovarian cancer with peritoneal carcinosis
Sonodynamic therapy

Sonodynamic therapy (SDT) is an emerging approach that involves a combination of low-intensity ultrasound and specialized chemical agents known as sonosensitizers. Ultrasound can penetrate deeply into tissues and can be focused into a small region of a tumor to activate a sonosensitizer which offers the possibility of non-invasively eradicating solid tumors in a site-directed manner. At the same time, the breath of evidence from SDT-based studies suggests that SDT is promising for cancer treatment.

Ultrasound application methods

• Low power ultrasound (1 – 2 W/sqcm)

• High frequency ultrasound 300 – 500 W (HIFU)

• Ultrasound shock waves
Sonosensitizers

Sonoinsensitizers

Figure 2. These sonosensitizers have been extensively used in some investigations of SDT in cancer treatment.
Sonosensitizers

Figure 2: Chemical structures of porphyrin-based sonosensitizers (A), xanthene-based sonosensitizers (B), non-steroidal anti-inflammatory drug-based sonosensitizers (C), and other sonosensitizers (D).
Possible mechanisms of SDT. Ultrasound irradiation induces cavitation around the surface of cancer cells. The energy produced by the collapse of cavitating bubbles initiates the formation of sonoluminescent light in cancer cells. Thus, sonosensitizer is activated from its ground state into an excited state. As the activated sonosensitizer returns to the ground state, the released energy can be transferred to the ambient oxygen to produce a large amount of ROS including oxygen ion, peroxide and singlet oxygen, which subsequently induce cancer cell apoptosis.
Figure 1  Drawing showing the formation, growth, and collapse of a cavitation bubble.
Activated Cancer Therapy Using Light and Ultrasound - A Case Series of Sonodynamic Photodynamic Therapy in 115 Patients over a 4 Year Period

J.N. Kenyon¹, R.J. Fuller¹ and T.J. Lewis²

¹The Dove Clinic, Twyford, Winchester, Hampshire, SO21 1NT, England; ²SonneMed, LLC, 10 Mt. Vernon St. Suite 208, Winchester, MA 01890, USA

Abstract: Activated Cancer Therapy (ACT), also known as Sonodynamic Photodynamic Therapy (SPDT) is a novel therapeutic modality that utilises a non-toxic photosensitive agent with reported ultrasound-activated properties. SPDT has previously demonstrated significant tumour cell inhibition in animal studies. There has been much research into the efficacy of photodynamic therapy and development in understanding of the underlying mechanism of tumour cytotoxicity. Synergistic ultrasound activation represents a promising development to activated sensitiser therapy, as photo-activation is limited by access and penetrance issues. Ultrasound has been demonstrated to activate a number of sono-sensitive agents allowing the possibility of non-invasive targeted treatment of deeper tumour sites than is currently achievable with photodynamic therapy. This case series of 115 patients with a variety of cancer diagnoses reports on experiences of this treatment over a 4 year period using sublingual administration of a new dual activation agent, Sonnelux-1, followed by a protocol of LED light and low-intensity ultrasound exposure. Initial clinical observation suggests SPDT is worthy of further investigation as an effective and well tolerated treatment for a wide variety of primary and metastatic tumours, including those refractory to chemotherapy.

Keywords: Sonodynamic therapy, photodynamic therapy, activated cancer therapy, ultrasound activated therapy, metastatic cancer, sonnelux-1, dove clinic, sonnemed.
Low power ultrasound device
(0.2 – 2.0W/sqcm)
High frequency ultrasound device (HIFU)
Ultrasound shock wave device
Lymphoma
B-cell lymphoma
<table>
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<tr>
<th>FPS</th>
<th>26</th>
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<tr>
<td>D/G</td>
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<tr>
<td>GN</td>
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<tr>
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B-cell lymphoma
B-cell lymphoma
10 days later
Sarcoma
Patient liposarcoma
Patient liposarcoma
Patient liposarcoma
Patient liposarcoma
Patient liposarcoma
10.2.2017
Patient liposarcoma
10.2.2017
Patient liposarcoma
10.2.2017
Patient liposarcoma
10.2.2017
Pancreatic cancer
Case report: pancreatic cancer, male, 45 y. (10.10.2016)
Case report: pancreatic cancer (13.10.2016)
Case report: pancreatic cancer (21.10.2016)
Ewing sarcoma
Case report, Ewing sarcoma, sacrum, female, 14 y. (31.10.2016)
Case report, Ewing sarcoma, sacrum, female, 14 y. (2.11.2016)
Case report, Ewing sarcoma, sacrum, female, 14 y. (3.11.2016)
Hello Dr Weber,

Yesterday I had review scans at Royal Marsden and I want to tell you my good news.

The scans showed reduction of tumours both in my lung and lesions in my head. The lung reduced around 40% in mass (that's my rough calculation based on 2d measurements given) as did the smaller cancer in my lung.

The doctor could not see the other lesions (there were about 14)
CT review for NT9LP680539, Sally Bowen DOB 14/1/62

The external CT chest and abdomen scan of 28/12/2016 has been reviewed and compared with the previous scan from 11/11/2016.

The superior right perihilar mass has further reduced in size, measuring 23 x 23mm (series 7 image 37) compared to 29 x 28mm previously. The hilar node inferiorly is now subcentimetre. No other focal lung lesions. No mediastinal or left hilar adenopathy.

No change in the liver cysts. The gallbladder, spleen, pancreas, kidneys and adrenal glands are unremarkable and unchanged. No abdominal lymphadenopathy. No bone lesions.

Comment: Further reduction in size of the right hilar mass and adjacent adenopathy consistent with further partial response.

Dr Anthony Aylwin Consultant Radiologist

Alliance Medical If you have any queries regarding this report, please contact Alliance Medical on +44 (0)20 7935 7711

*** END OF REPORT ***

Private & Confidential 01483 303106 Dr. L A Parkinson Brain HealthTen Harley Street Ltd 10 Harley Street W1G 9PF
Hyperbaric oxygen chamber
New therapeutic strategies for cancer therapy

- Photodynamic and sonodynamic therapy with liposomal ICG, Chlorin E6, Hypericin and Curcumin (external, interstitial, intratumoral irradiation)
- Hyperbaric oxygene therapy
- Low dose chemotherapy using chemodrugs as photosensitizers
- Immunotherapy with intravenous laser blood irradiation
- Immunotherapy with GcMAF, TBL12, dendritic cells, oncolytic viruses and other methods
The new laser watch
The Laser watch

- 18 Laser diodes
- wavelength 650nm
- power 5mW each
Radial Artery

Lie Que (Lung 7), Jingqu (Lung 8) and Tai Yuan (Lung 9) Acupuncture Points

Neiguan Acupuncture Point (P6)

Daling Acupuncture Point (P7)

Ulnar Artery

Lingdao (Heart 4), Tongli (Heart 5), Yinxi (Heart 6) and Shenmen (Heart 7) Acupuncture Points
Laser Pad for Local Pain Treatment

The 650nm laser can directly penetrate the Ashi points (= pain points). It activates the lysozyme and phagocytic cell activity and thereby demonstrates anti-inflammatory effects.

1. Connect the pad to the corresponding jack and place it over the area you want to treat.

Please note that a jointly use of the laser pad and the nasal probe or the laser watch is not possible.
fig. 2: Laser blood irradiation with the laser watch
Fig. 3: Acupuncture points which are stimulated through the laser watch (mod. from [5]).
Indications

1. Improvement of blood viscosity and microcirculation as a protection against heart attacks and stroke
2. Improvement of hypertension
3. Improvement of the immune system by stimulation of the different white blood cells
4. General energising effects which act against fatigue and contribute to improved performance
5. Improved sleep by increased release of serotonin and melatonin
6. Prevention of jet lag after long flights by enhanced release of melatonin
7. Protection against thrombosis (on long flights)
8. Anti-inflammatory effects in combination with UltraCur+ (Curcumin)
9. Additive cancer therapy and prevention in combination with chlorophyll
From laser research

Zeitschrift für Akupunktur & Aurikulomedizin
Magazine for acupuncture and auricular medicine

5th October 2015

Daniela Litscher und Gerhard Litscher

LASER WATCH – SIMULTANEOUS LASER ACUPUNCTURE AND LASER BLOOD IRRADIATION AT THE WRIST

Research unit for Complementary and Integrative Laser Medicine,
Research unit for Biomedical Technology in Anaesthesia and Intensive Care
TCM Forschungszentrum (Research centre) Graz, Medizinische Universität Graz (Medical University of Graz), 8036 Graz, Austria
Diagram:
- Heart Rate Variability (HRV)
- Laser watch
- 20 minute laser stimulation
- Time

Herzratenvariabilität (HRV)

20 min Laserstim.
Laseruhr

20 min Laserstim.

+ 15%

Mikrozirkulation

Diagram:
Laser watch
20 minute laser stimulation
Microcirculation
Room temperature

Raumtemperatur
26,5 °C
The new laser watch
first multi center study in
Switzerland

Dr. med. Andreas Wirz-Ridolfi,
Reinach/Schweiz
Prof. VRC, Chirurgie FMH,
Akupunktur/TCM ASA
Participants

- 20 patients (12 male, 8 female), 18 bis 76 y.
- 2 patients with type 1 diabetes
- 18 patients with type 2 diabetes
Results: Blood pressure

- Highest value:
- Before: 170/90, after: 140/85 mmHg
- Lowering of blood pressure in average:
- Systolic 10.04, Diastolic 6.54 mmHg
- In percentage: 7.9%
Lipids: Cholesterol

- Average before: 5.95, after: 5.5 mmol/l
- Lowering in average: -0.39 mmol/l
- In percentage: -6.6%
Lipids: LDL

Average before: 3.63, after: 3.34 mmol/l.
Lowering in average: -0.28 mmol/l
• In percentage: -7.8%
Liver: GPT

- Average before: 29,14 IU/l. after: 24,47 IU/l
- Lowering in average: - 4,66 IU/l
- In percentage: - 16,0 %
Liver: GammaGT

- Average before: 47.84 IU/l, after: 39.70 IU/l
- Lowering in average: -8.14 IU/l
- In percentage: -17.0%
Case report diabetes mellitus type 2

Patient, 62 J., male, therapy with

Metformin 2 x 1000 mg, Candesartan 32 mg

Diagnosis: Diabetes Typ 2, Hypertension

Therapy:
3 month red laser watch,
3 months red-blue laser watch in combination with Curcumin (Ultracur)
# Case report: HbA1c

<table>
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<th>Parameter</th>
<th>Ergebnis</th>
<th>Richtwert max.</th>
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<td>HbA1c</td>
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<td>31.05.20</td>
<td>HbA1c</td>
<td>10,1</td>
<td>6,5</td>
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<td>14.07.20</td>
<td>HbA1c</td>
<td>8,1</td>
<td>6,5</td>
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<td>29.08.20</td>
<td>HbA1c</td>
<td>7,2</td>
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<td>07.10.20</td>
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<td>6,7</td>
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## Case report: Cholesterol

<table>
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<td>03.05.2016</td>
<td>Cholesterin</td>
<td>208,0</td>
<td>200,0</td>
</tr>
<tr>
<td>31.05.2016</td>
<td>Cholesterin</td>
<td>210,0</td>
<td>200,0</td>
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<tr>
<td>14.07.2016</td>
<td>Cholesterin</td>
<td>199,0</td>
<td>200,0</td>
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<tr>
<td>05.09.2016</td>
<td>Cholesterin</td>
<td>178,0</td>
<td>200,0</td>
</tr>
<tr>
<td>07.10.2016</td>
<td>Cholesterin</td>
<td>189,0</td>
<td>200,0</td>
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</tbody>
</table>
## Case report: LDL-Cholesterol

<table>
<thead>
<tr>
<th>Datum</th>
<th>Parameter</th>
<th>Ergebnis</th>
<th>Richtwert min.</th>
<th>Richtwert max.</th>
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<tbody>
<tr>
<td>03.05.20</td>
<td>LDL-Chol.</td>
<td>153,0</td>
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<td>LDL-Chol.</td>
<td>143,0</td>
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<td>155,0</td>
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<td>14.07.20</td>
<td>LDL-Chol.</td>
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<td>155,0</td>
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<td>LDL-Chol.</td>
<td>119,0</td>
<td>50,0</td>
<td>155,0</td>
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<td>07.10.20</td>
<td>LDL-Chol.</td>
<td>125,0</td>
<td>50,0</td>
<td>155,0</td>
</tr>
</tbody>
</table>
Own study results:

Significant increase of Melatonin (30-100 %)

( Dr. Weber in A 380 from Bangkok to Frankfurt)
New laser watch, red-blue
Combination with curcumin

UltraCur +

Curcumin:
Strong antioxidant
with anti-inflammatory and
pain-reducing effects

Highly concentrated curcumin with a 15,000-fold bioavailability

Due to a special protein binding the full potential of this unique medicinal plant can be realized for the first time!

One capsule UltraCur+ has the efficacy of 120g of curcumin.

In relation to conventional curcumin this corresponds to a 15,000-fold bioavailability.
Photodynamic effects:

- Curcumin absorbs blue light 447 nm
- Is a highly effective **Photosensitizer** for PDT for cancer, infectious and autoimmune diseases
- Is in low concentrations phototoxic, works as a sonosensitizer, stimulates the immune system, antitumoral, antimetastatic and antiangiogenetic effects
PhotoActive+ is an intelligent supplement rom natural plant extracts. It combines water soluble Chlorophyllin (green) with Phycocyanin (blue)
Chlorophyllin

- Chlorophyllin’s unique molecular structure allows it to act as an “interceptor molecule” that binds to the harmful carcinogens and excretes them from the body before they can damage your DNA.

- In addition, chlorophyllin has been found to inhibit the growth of cancer cells, reduce excessive oxidative damage that can lead to cancer, support the immune system, and boost the effectiveness of cancer drugs.

- Chlorophyllin’s ability to bind to carcinogens and excrete them from the body before causing DNA damage makes it a safe and low-cost way of protecting against unavoidable environmental carcinogens.
Chlorophyllin

- Photosensitizing Effects Of Chlorophyllin
- *Photodynamic therapy* is an exciting new cancer treatment typically used for *small, local tumors*\(^5\) on or just under the skin, or on the lining of internal organs and cavities, such as the bladder.\(^6\)-\(^8\) The therapy involves injecting into the bloodstream an agent called a *photosensitizer*, which is sensitive to a particular type and wavelength of light.\(^7\)
Next conferences:

- International Laser conference in Bangkok, November 25th and 26th November 2016

- Next international ISLA-conference in Germany June 10/11 2017 in Germany
Thank you