The World Association of Laser Therapy

WALT
SOUTH AFRICA 2008

CONFERENCE 2008

19 - 22 October 2008
Sun City, South Africa

Programme and Abstracts

WALT
World Association for Laser Therapy

UNIVERSITY OF JOHANNESBURG

October 2008

Dear Delegate,

It is a great pleasure for me to welcome you to the 7th International Congress of the World Association of Laser Therapy (WALT) at Sun City in the Northwest province of South Africa. This promises to be a particularly interesting congress all round, with a wide range of plenary lectures, specialist presentations and contributed papers as well as the regular workshop and a variety of social events.

It is indeed a great honour for us to host this international congress in South Africa for the very first time and for the first time on the African continent. We are extremely proud of the fact that no less than 6 continents and 28 countries will be represented this year!

I wish to pay tribute to the untiring efforts of my organising committee, Dr. Nicolette Houreld, Dr. Denise Hawkins Evans, Dr. Raymond Sparrow as well as the congress secretariat, Technoscene, who never hesitated in their efforts to accommodate every request possible. Ms. Cherise Schaerer is also thanked for her valuable contribution to make this event successful.

No congress can be a success without the support of Industry and we would like to express our sincere gratitude to all our sponsors who have involved themselves with the congress.

To our delegates, please take every advantage of this special opportunity to enrich your interest and expertise in laser therapy and use this congress to meet old friends and make new contacts.

Finally, on a personal level, I am so proud to welcome all delegates and friends to South Africa, our wonderful country with its rainbow nation and I wish all delegates a magnificent, enriching congress and safe stay in our magical country!

President: Organising Committee WALT 2008

CONTENTS

LETTER FROM THE PRESIDENT OF WALT

It is my great honor and pleasure to present the WALT 2008 to be held in Sun City**,** South Africa from October 19 - 23, 2008.

We expect that the congress will not only be the largest event of the year in Laser medicine, but that it will also provide all of us with the best of science and education. WALT 2008 will give us the opportunity to re-evaluate Laser Therapy and predict its future and at the same time will bring you up-to-date on the current uses of lasers in the therapeutic arena.

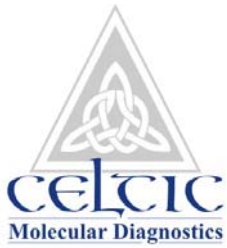
I hope the meeting offer you a wonderful and relaxing time in Sun City. Sun City is internationally renowned as Africa's premier holiday resort. The resort offers a myriad of different entertainment and relaxation opportunities, as well as enough attractions and activities to make your stay memorable. We plan to take care of both with a carefully designed scientific agenda backed up by an equally well-thought out social program. This was made possible with the help of the University of Johannesburg, the Council for Scientific and Industrial Research (CSIR), National Laser Centre (NLC) and the African Laser Centre with the support of the Department of Chemistry at Rhodes University.

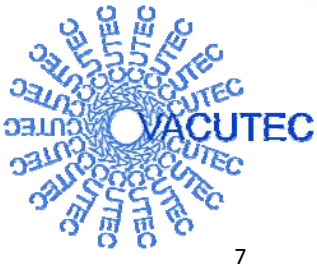
Prof. Abrahamse & the rest of the Organizing Committee have put a great effort in the preparation of this Congress. My kudos to you!

We count on your presence to make this congress a great event. On behalf of the WALT Executive Committee, we welcome you to an outstanding scientific congress.

FAROUK A.H. AL-WATBAN, MSc, PhD

WE WOULD LIKE TO THANK THE FOLLOWING SPONSORS AND EXHIBITORS FOR THEIR GENEROUS SUPPORT





CEU ACCREDITATION

The WALT 2008 Conference has been accredited with the following CEU points:

Conference in its entirety:	16 CEUs Reference number: PPB007/004/10/2008
Conference: Sunday 19 October:	1 CEU Reference number: PPB007/005/10/2008
Conference: Monday 20 October:	5 CEUs Reference number: PPB007/006/10/2008
Conference: Tuesday 21 October:	6 CEUs Reference number: PPB007/007/10/2008
Conference: Tuesday 21 October:	4 CEUs Reference number: PPB007/008/10/2008

Delegates who would like to earn CEU points have to sign the register documenting session attendance. The register will be available at the conference registration desk. A certificate reflecting the CEU points will be mailed to you after the conference.

WINE TASTING INVITATION

Monday 20 October 2008

18:00 – 19:00

Baobab room

You are invited to a unique wine tasting experience.
A cross-section of the best South African wines has been selected and will be presented by Jacques Vandewalle, manager of the Vinoteque Wine Bank in Stellenbosch.

Jacques has been specially been flown out to Sun City from Stellenbosch, the South Africa`s premier wine growing region, to lead this presentation.

Come and taste 7 unique wines, one of them made from a new grape only recently `created` in South Africa, right through to South Africa`s own Pinotage and other red wines all from highly acclaimed producers. There will be a Chardonnay and a sweet Noble Late Harvest to end off the session.

This tasting will take you through a glimpse of the industry's best and impress you with what the country can produce to compete with the best in the world.

Questions will be welcomed at this interactive professional wine tasting.

IMPORTANT INFORMATION

- The **Welcoming Function** will start at 19:30 on Sunday 19 October at the Valley of the Waves. Please wear comfortable clothing and shoes – this is a beach party!

- **Wine tasting:** All delegates are invited to a wine tasting on Monday 20 October 2008 in the Baobab room. More information about this appears on the "Wine Tasting" page. Delegates who would like to attend this event should please give their names at the Conference Desk before 12:00 on Monday 20 October.

- The **Gala dinner** will take place on Tuesday 21 October at 18:30 for 19:00 in the Baobab Room. The dress code will be smart casual. All delegates should please write their names on the "Table register" at the Conference Desk before Tuesday lunchtime. We need this to do the table seatings at the dinner.

- The venues for the sessions will be: the **Baobab Room** (ground level of the Sun City Hotel), the **Tlou Room,** the **Tshukudu Room** and the **Tutlwa Room** (all one floor down in the Letsatsi Conference Centre).

- Please wear your **name tag** at all times to gain access to the conference venues and functions.

- All **drinks** during meals in the restaurant will be for your own account.

- **Assistance:** Please feel free to contact either the conference secretariat or members of the organising committee should you have any problems.
  Thereza Botha: +27 83 375 7373
  Carlo Spruyt: +27 84 500 0724
  Elana Botha: +27 83 300 7813
  Student assistants will also be available to assist delegates.

- **Oral Presentations:** Speakers are requested to load their presentations at registration on Sunday 19 October.

- **Certificate of Attendance:** All delegates will get a Certificate of Attendance for participating in WALT 2008. Please collect this at the last day of the conference from the Conference Secretariat.

- **Poster Presentations:** Delegates are requested to have their posters up by morning tea on Monday 20 October and remove them by lunch on Tuesday 21 October.

- **Transport:** Delegates making use of the shuttle service to O R Tambo International Airport must confirm their departure date and times from Sun City at the Conference Desk at registration. Please note that there are complimentary inter-hotel transfers available at the resort.

- **Internet Connectivity:** Sun City Resort has Wireless Internet Hotspot areas throughout the resort (see "Contents" for reference to page with more information). The system works on a prepaid basis with airtime being purchased by credit card or voucher. In addition, the

Conference Centre has an Internet Café and Business Centre from which emails and faxes can be sent.

- **Group Photograph:** A group photograph will be taken on Monday 20 October at 12:45. The exact location will be announced during the course of the morning. The photographer will be taking photographs during some sessions and the social events. Should you wish to order specific photographs, please arrange this with the Conference Desk.

- **Meals:** Breakfast is included in the accommodation and will be served at the hotel in which you are staying. Please contact the reception desks in each hotel for further details and times. Lunches will be served at the Sun City Pool Deck or Calabash Restaurant (in the event of rain) in the Sun City Hotel. There are at least 8 different restaurants at the resort where delegates can choose to eat during the free evenings.
  Restaurant Options:
  - Palm Terrace at the Cabanas Hotel
  - The Peninsula Restaurant at the Cascades Hotel
  - The Calabash Restaurant at the Sun City Hotel =
  - The Orchid Restaurant at the Sun City Hotel
  - The Crystal Court Restaurant at the Palace Hotel
  - Raj Restaurant
  - The Santorini Restaurant at the Cascades Hotel
  - The Villa Del Palazzo at the Palace Hotel

- **Drinking Water:** Tap water is purified and 100% safe to drink and bottled water can be purchased. South Africa is a country with limited water resources, and everyone is encouraged to save water as much as possible.

- **Currency:** The currency of the Republic of South Africa is the South African Rand – ZAR, which is divided into 100 cents. Notes and coins currently in circulation are as follows:
  Banknotes: R10, R20, R50, R100, R200
  Coins: 5 cent, 10 cent, 20 cent, 50 cent, R1, R2, R5

  Although the exchange rates vary on a daily basis, the following rough estimates can be used:
  1 US$ = R 8.50
  1 British £ = R 15.00
  1 € = R 11.80
  1 Brazilian Real = R 4.50

  Foreign currency can be exchanged at any Bureau de Change. There are also Automatic Teller Machines at Sun City. Credit cards such as Visa, MasterCard, Diners Club and American Express are generally accepted by most shops, although some may only accept Visa and MasterCard.

- **Mailing Services:** Out-going mail, fax, copy and e-mail services are available at Sun City. These services will bear extra costs for delegates. A contact telephone and fax numbers will be supplied to delegates who have registered closer to the date of the conference.

- **Leisure activities at Sun City:** Various exciting leisure activities are available at Sun City.
  Please enquire about these at the reception desks in your hotel, or at the Welcoming Centre.

- **Medical Assistance:** A medical first aid kit will be available at the conference registration desk. Medical and emergency services are available in the case of severe illness at Sun City.

- **Safety:** Tourists should remember that the same precautions should be taken when visiting South Africa than in any other country in the world. Rooms are fully equipped with a small safe for locking away of your passports, money and other valuables. The resort has a well developed security system with the safety of its visitors a high priority.

- **Smoking Policy:** Smoking is prohibited in all public places, unless marked as a smoking area. Specifically, smoking in classrooms, lecture halls, auditoriums, theatres, restrooms, etc. is prohibited.

- **Telephone:**
  To phone out of South Africa: dial 00 before the country code

Local inquiry service:	1023
The time:	1026
International inquiry service:	0903

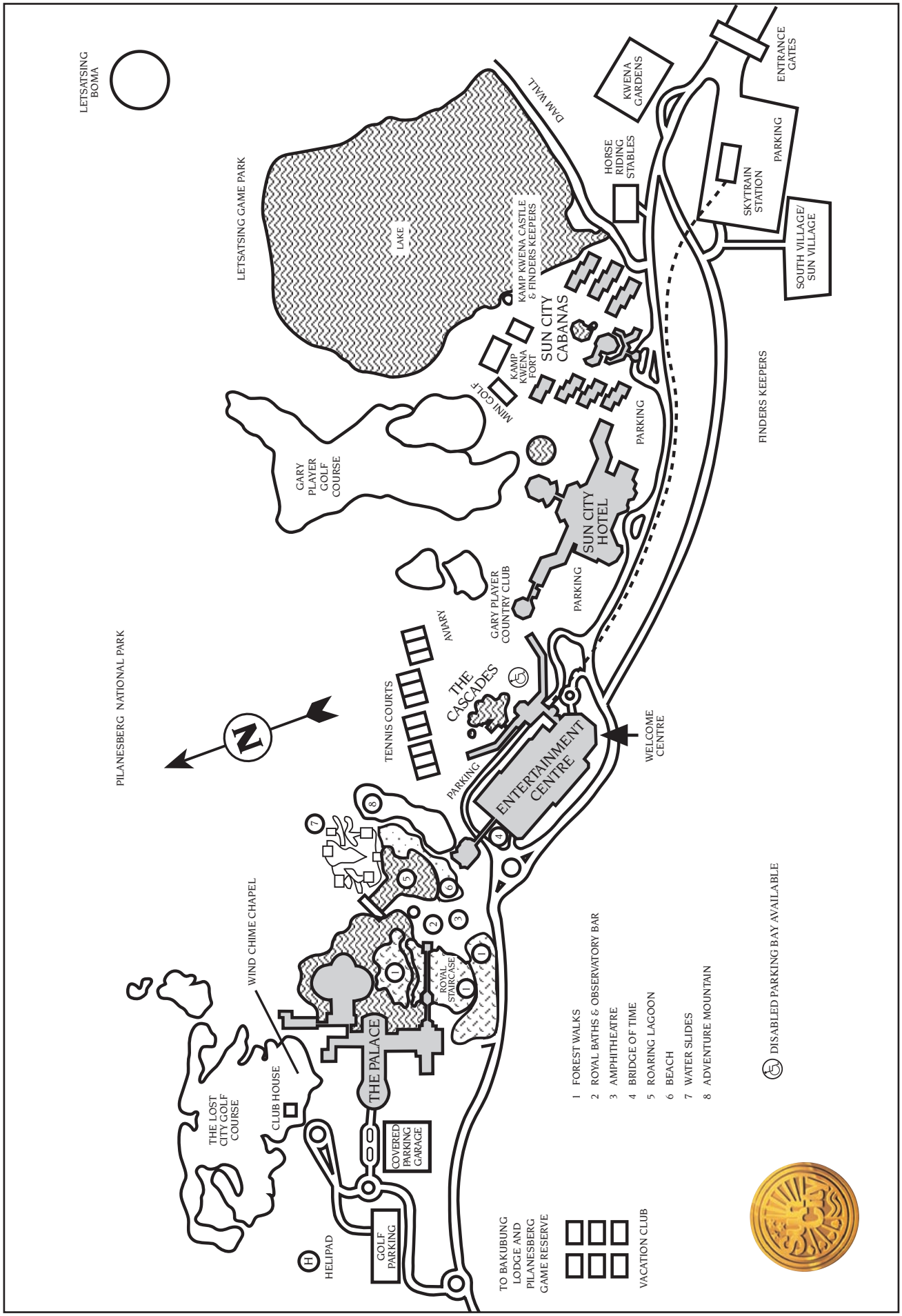
- **Time Difference:** Throughout the year, Standard Time in South Africa is 2 hours ahead of Greenwich Mean Time, I hour ahead of Central European Winter Time and 7 hours in advance of Eastern Standard Winter Time in the USA.

- **Tipping:** Restaurants usually do not include the tip in the bill. A 10 – 15% service fee usually applies, depending on the standard of service provided. Tipping stays the prerogative of the client.

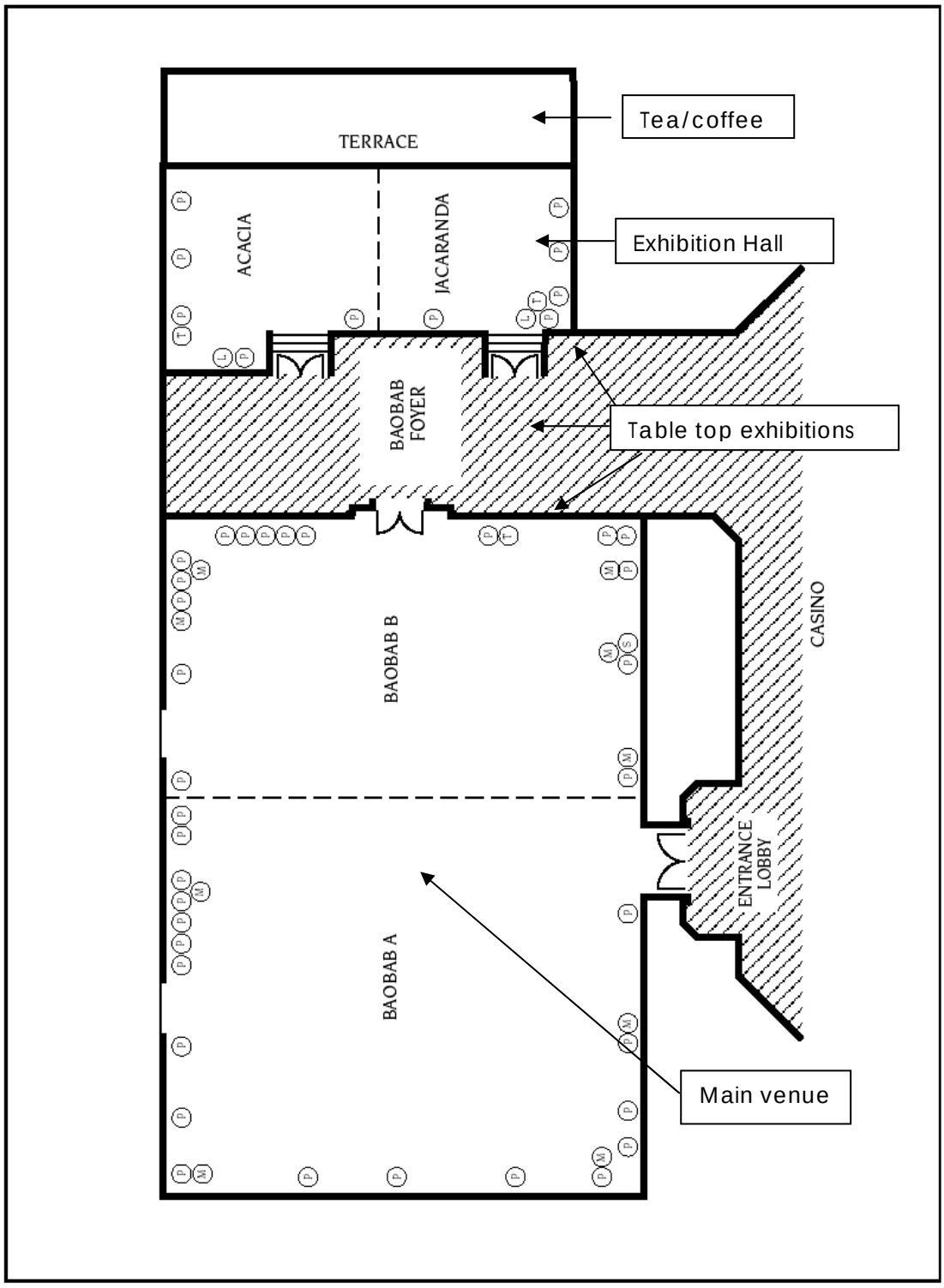
- **VAT (Value Added Tax):** Vat, currently at 14% is included in the marked/quoted price of most goods and services. Foreign tourists may claim refunds of VAT paid on goods which they take out of South Africa. Information leaflets on the procedure to follow are available from VAT Refund Administration offices at O R Tambo International Airport.

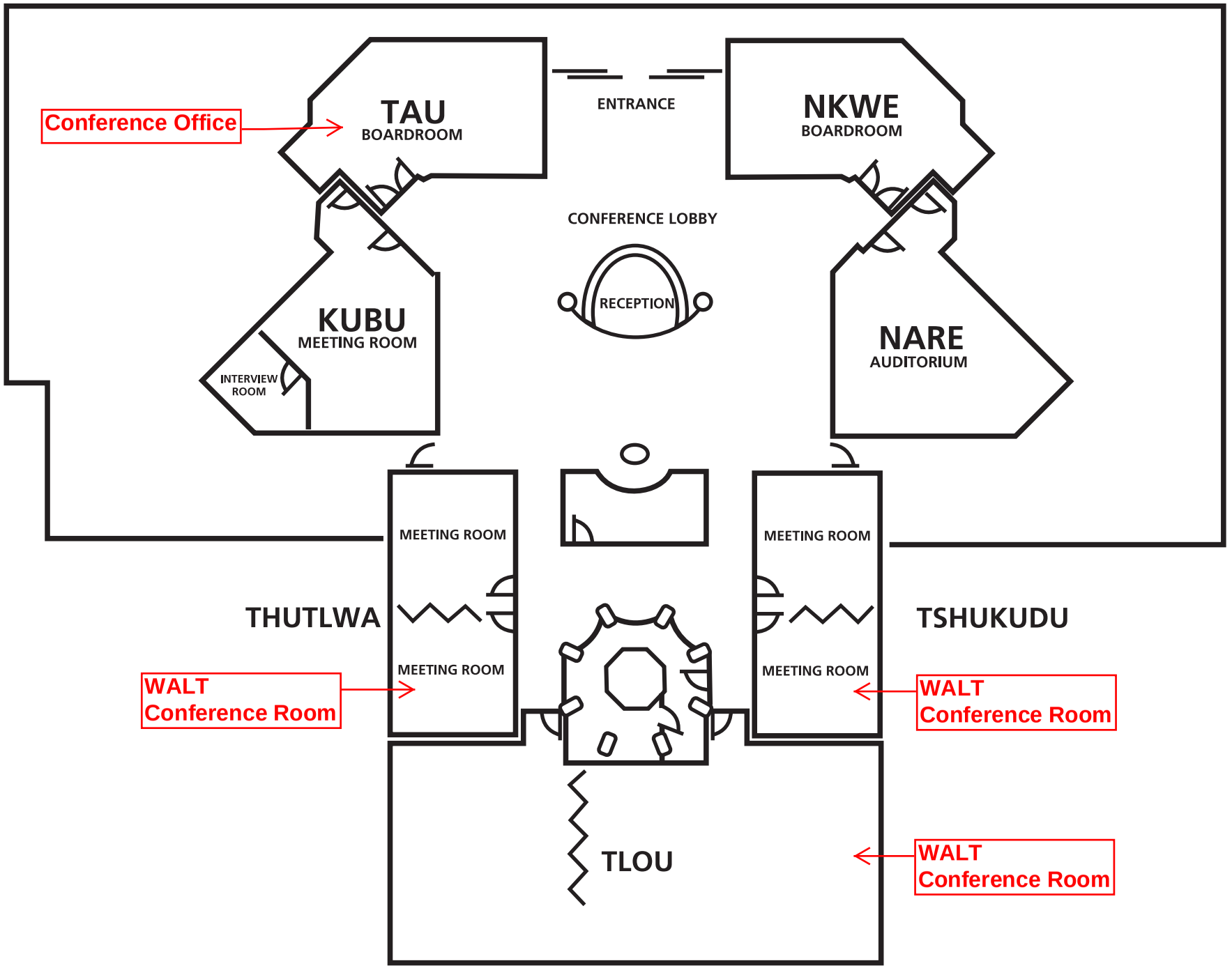
WE HOPE YOU ENJOY YOUR STAY AT SUN CITY!

SUN CITY RESORT MAP



SUN CITY HOTEL CONFERENCE CENTRE

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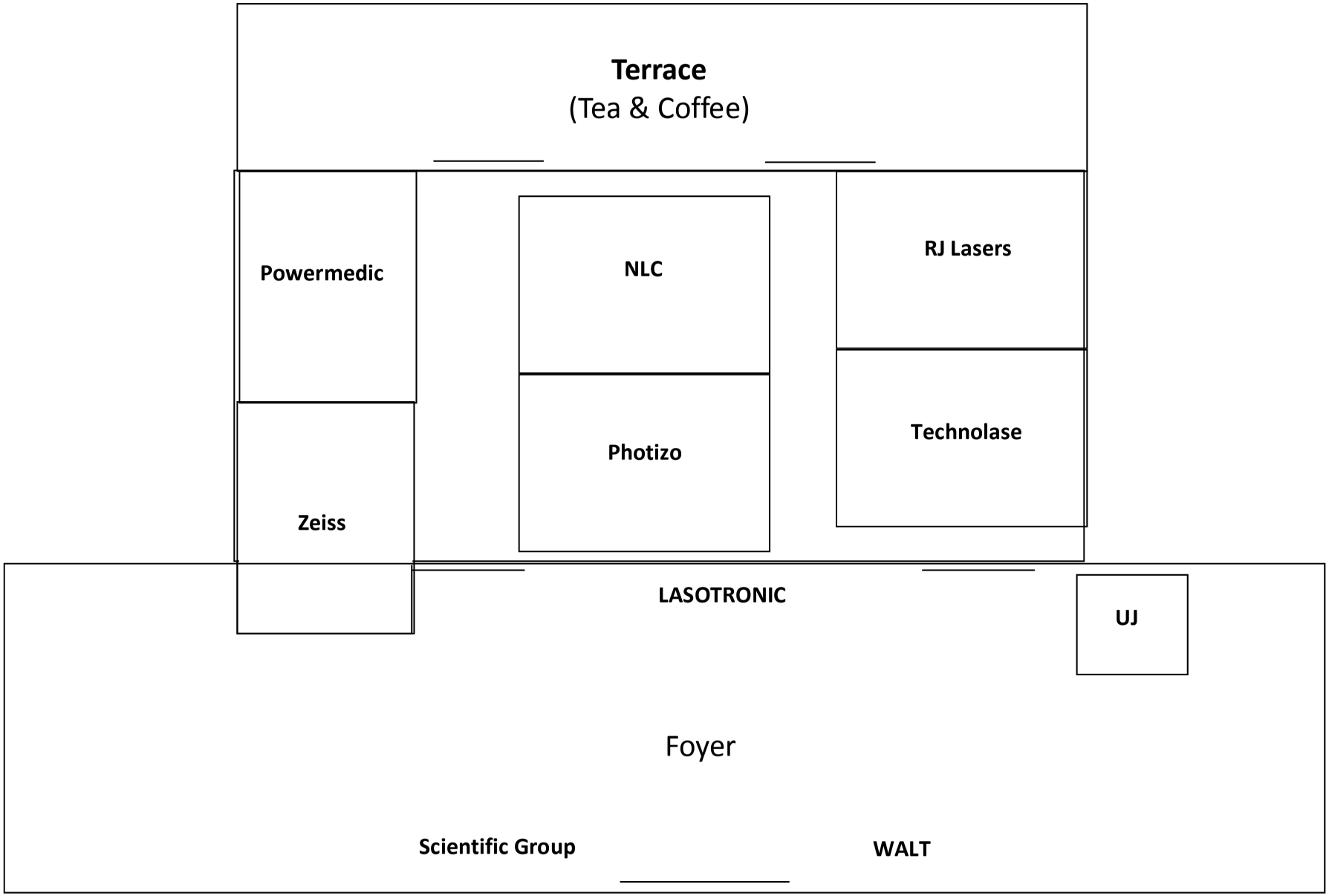
WALT 2008 EXHIBITONS



PLENARY SPEAKERS

Antonio Luiz Barbosa

Pinheiro Professor Antonio Luiz B Pinheiro began his higher education at the Federal University of Pernambuco, Recife, Brazil, being graduated in Dentistry in 1982. Between 1986 and 1988 he studied Oral and Maxillofacial Surgery at the Pernambuco School of Dentistry, where he ot his specialist degree in 1989 under supervision of Prof J J Barros. Between 1989-1993 he moved to the University of Birmingham, Birmingham, UK, where got his M Dent Sci degree in Oral Surgery and Oral Medicine in 1990 under supervision of Prof J W Frame and 1993 got his PhD degree in Clinical Dentistry under supervision of Professors J W Frame and Roger M Browne. Back to Brazil in 1994, started his academic work as Associate Professor of Oral and Maxillofacial Surgery at the School of Dentistry of the Federal University of Permabuco, Recife, Brazil, where he started his major research work on lasers in 1995. In 2000 Prof. Pinheiro got his full Professorship at the School of Dentistry of the Federal University of Bahia, Salvador, Brazil, to where he moved all his research up to now. Professor Pinheiro held several positions on both Governmental and Scientific organizations during his academic life. He is senior researcher of the Brazilian National Council for Scientific Development – CNPq since 2004; he has served as Treasurer of the WALT from 2004-2006 and as General-Secretary since 2006. His major research fields are the study of the effects of light on bone healing; on the effects of light on diabetic or undernourished subjects and on burn subjects. Prof Pinheiro has also actively acted as reviewer or on the Editorial Board of important journals, including Photomedicine and Laser Surgery, Lasers in Medical Sciences, Journal of Photochemistry and Photobiology B; Proteome Research, Journal of Biomedical Optics, Cell Biology International, oral oncology and others.

Prof. Dr. rer. nat. Rudolf W. Steiner

Born	18.12.1941 in Prague, CSFR
1952 - 1962	Oberrealschule Augsburg
1962 - 1964	Military service (Hptm. d. R.)
1964 - 1969	Physics student at the Technical University Munich (Physics A, including education in engineering). Diploma thesis in Biophysics (Dipl.-Ing.).
1970 - 1972	PhD student at the C.N.R.S. in Montpellier, France; received the degree Dr. rer. nat. from the Technical University Munich
1972	Fellow of the Dr. Carl Duisberg Foundation (Bayer)
1972 - 1973	NATO-Fellow at the C.N.R.S. in Montpellier, France.
1973 - 1986	Head of the laser laboratory for diagnostic applications in Medicine and Biology, Institute of Clinical Physiology, University of Düsseldorf 1979 Habilitation in Biophysics; 1985 Professor, apl.
Since 1986 until 31.12.2007	Director of the “Institut for Lasertechnologies in Medicine and Metrology (ILM)” at the University of Ulm. Professor and faculty member (Medical Faculty) of the University of Ulm.
Activities:	Member of the board of several journals Member of the WLT (Association of the laser centers in Germany). Expert for the „Deutsche Forschungsgemeinschaft“ (DFG) Expert for the Ministry of Science and Education (BMBF), member of the board for Optical Technologies. Expert for the European Commission Member of the advisory board of the industrial association SPECTARIS.

Dr Shimon Rochkind

Dr. Shimon Rochkind is a Specialist in Neurosurgery and Microsurgery
Director, Division of Peripheral Nerve Reconstruction,
Tel Aviv Sourasky Medical Center, Tel Aviv University, Israel.
Specialization in microsurgery and neurosurgery of peripheral nerves, brachial plexus, lumbo-sacral plexus, cauda equine and spine.
Fellowship Director, American Society for Peripheral Nerve
Member of Peripheral Nerve Surgery Committee of the World Federation of Neurosurgical Societies.

Scientific and Clinical Interest:

1. Clinical development and use of modern microsurgical and reconstructive approaches for treatment of peripheral nerve, brachial plexus and spine.
2. Clinical development and use of modern microsurgical approaches for treatment of spinal cord/cauda equine pathology and peripheral nerve and brachial plexus tumors.
3. Experimental studies on reconstruction of complete peripheral nerve and spinal cord injury using nerve cell tissue engineering technology.
4. Clinical and experimental development of laser technology and methodology for treatment of injured peripheral nerve.

Teaching and Visiting Professor at USA, Canada, Japan and European Societies; Academic of Russian Laser Academy of Science.

***Member of*:** American Society for Peripheral Nerve; American Spine Society; World Federation for Neurological Surgery, American Association of Neurological Surgeons and Congress of Neurological Surgeons Section of Disorders of the Spine and Peripheral Nerve, European Association of Neurosurgical Societies, Israeli Neurosurgical Society; European Society for Pediatric Neurosurgery, World Association for Laser Therapy, and others.

Invited Guest Lecturer: USA, Japan, U.K., Germany, Austria, Swiss, Spain, Russia, Ukraine, Italy, Greece, Denmark, Sweden, Brazil, Argentina, Cyprus, Turkey, Iceland, Australia and South Africa.

Senior Editor of *Photomedicine and Laser Surgery* journal.

Editorial Board Member of the *Journal of Reconstructive Microsurgery* and additional 2 international clinical and scientific journals;

Reviewer of 8 international clinical and scientific journals.

***Awards*:** Recipient of 9 international and 4 national awards for basic and clinical research.

***Patents*:** 7 patents for scientific developments USA, Europe, Israel.

***Publications*:** Author of 82 clinical and scientific articles and 20 chapters in books.

INVITED SPEAKERS

Heidi Abrahamse

Prof. Heidi Abrahamse BSc (RAU), BSc Honours Biochemistry and Psychology (US, UNISA), MSc (US), PhD Molecular biology (Wits), was born in Klerksdorp, South Africa and graduated from the University of the Witwatersrand in 1997. She has been associated with several tertiary education institutions, where she has contributed by conducting and establishing research units and research management structures and compiling policy documents for research. She serves on several research-related university committees including the Academic Ethics and Higher Degrees Research Committees. She has lectured several undergraduate as well as post-graduate courses and currently heads the Laser Research Group, an established Research Centre in the Faculty of Health Sciences at the University of Johannesburg.

She has graduated more than 25 post-graduate students, published 40 peer reviewed international research papers including chapters in books and hold grants for research from several national research funding bodies such as the Medical Research Council, the National Research Foundation, the Council for Science and Inductrial Research and the National Laser Centre. She holds membership and honorary advisorship to several international societies and research bodies (WALT, SASBMB, ASBMB; ASCB, SPIE, OSA, WALA) and acts as reviewer for several funding bodies and international journals. Her research areas of interest include phototherapy, laser-tissue interaction, signal transduction in cancer, wound healing and stem cell differentiation.

Farouk Al-Watban

Dr. Farouk Al-Watban earned his Masters of Science Degree from the University of St. Andrews, College of Science in 1975. He obtained his Doctorate from the University of Heriot Watt, College of Science, Edinburgh, UK in 1978. His fields of specialization that he worked for the last 27 years are Laser and its Applications (PDT, LPLT, Laser Biostimulation, Laser Medical Applications, and Laser Safety & Regulations).

He has been with the King Faisal Specialist Hospital and Research Centre (KFSH&RC) since 1982. He was first an Assistant for Technical Affairs to the Supervisor and Director of KFSH&RC. And was Deputy Director of Research Centre until 1985. Simultaneously, he established PD Therapy and later the first Laser Wound and Burn Healing particularly in Diabetics in KFSHRC. At present, he is the Principal Scientist and Head of Laser Medicine Research Section.

He was elected President of WALT in 2004 in Brazil (from 2006-2008). Dr. Al-Watban is the Founding President of the World Academy for Laser Applications (WALA www.laser-wala.com). He is a Fellow of the American Society for Laser Medicine and Surgery (FASLMS) since 1986. He was Editorial Board member of the Laser Therapy (which later became the Photomedicine & Laser Surgery Journal), the official Journal of WALT, NAALT and many other laser societies. In 1983, he served as Editorial Board Member of the KFSH&RC Medical Journal (Annals of Saudi Medicine).

He has organized successful conferences both locally & internationally. He is a prolific Educator of Laser Safety Regulations & Applications in the Kingdom. He has established the first Laser Dosimetry Laboratory in KFSHRC. He has proctored examinations for the American National Council on Laser Excellence (NCLE).

His experience in research has generated a number of international publications. He had published 126 papers & abstracts mostly in international conferences and specialized medical journals. His other publications also appeared in several local newspapers and journals. He published a book entitled "Laser and Its Application (in Arabic) published by Mars Publishing House Riyadh and 5 book chapters in English namely “Photodynamic Therapy Variation in Biological Activities of HPD and Biological Effectiveness with RIF-1” (Experimental Results)” published by Plenum Publishing Corporation, New York., “Therapeutic Lasers Effectiveness and Dosimetry” under Kluwer Academic Publishers, “Laser as a Wound Healer” In Comparison with Pharmacological Drugs, LED and Conventional Light Sources” ” published in The Millennium Laser Book Trilogy, Lasers in Medicine Surgery and Dentistry, European Medical Laser Association (Part Three), “Medical Lasers for Photodynamic Therapy and Wound Healing Acceleration” published in Practicing Laser Medicine and Surgery in India and recently the “Photobiostimulation: The Effect of Various Lasers in Non-Diabetic and Diabetic Wound and Burns” 4th Book “Laser Medicine, Dentistry, Surgery and Veterinary, by Zlatko Simunovic et.al.eds. for EMLA. He established the First research and Publication in the Third World on Photodynamic Therapy & LPL Therapy of Wound & Burn healing particularly for Diabetics since 1985.
Several awards, distinctions and Certificates of Appreciation have been awarded to him including a Certificate of Appreciation from the First International Conference on PDT and Diagnosis, held in Tokyo, Japan and Certificate of Recognition given by the Laser Institute of America (LIA) for his significant contribution to Laser Technology.
All details are available at www.laser-wala.com , the official WALA website.

Juanita J Anders

PRESENT POSITION
Professor, Department of Anatomy, Physiology and Genetics, F. Edward Hebert School of Medicine, Uniformed Services University of the Health Sciences (USUHS)

EDUCATION
Postdoctoral Training
Laboratory of Neuropathology and Neuroanatomical Sciences, National Institute of Neurological and Communicative Disorders and Stroke, National Institutes of Health (1977-1980)

1977 - Ph.D. Anatomy, University of Maryland Medical School
Thesis Title: The organization and autonomic innervation of the vascular system of the mammalian spinal cord.
1972 - M.S. Zoology, Pennsylvania State University
Thesis Title: The optic system of the teleost *Cichlasoma biocellatum*.
1969 - B.A. Wilkes College, Pennsylvania, Department of Biology.

PATENTS
Title: LIGHT PROMOTES REGENERATION AND FUNCTIONAL RECOVERY AFTER SPINAL CORD INJURY. Inventors: Juanita J. Anders, Ilko K. Ilev, Ronald W. Waynant and Kimberly R.Byrnes US Provisional #60/460,421 filed 4/7/2003, has been converted to US Patent Application 10/820,443 filed 4/7/2004, and US Patent Application 11/022,314 filed 12/23/2004.
This technology has been licensed and is being developed by PhotoThera, Inc., a specialty biotechnology company that was formed to develop FDA approved medical devices using light.
Title: LIGHT AS A REPLACEMENT FOR MITOGENIC FACTORS ON PROGENITOR CELLS Inventors: Tara B. Romanczyk and Juanita J. Anders (USU), Ilko K. Ilev, PhD (FDA), and Leonardo Longo, MD, PhD

(Institute of Laser Medicine, University of Siena, Siena, Italy) Provisional Patent Application: No. 60/666,582 filed 03/31/05, Patent Cooperation Treaty Patent Application No. PCT/US06/11573 filed on 3/30/2006

EDITORIAL POSITIONS

Associate Editor, Journal of Neurocytology 1991- 2000
Editorial Board of Journal of Photomedicine and Laser Surgery 2003- Present
Editorial Board of Journal of Lasers In Surgery and Medicine 2005

REVIEWER FOR THE FOLLOWING JOURNALS (1983-PRESENT):

Brain Research
Journal of Histochemistry and Cytochemistry
Journal of Comparative Anatomy
Lasers in Surgery and Medicine
Acta Anatomica
Journal of Photochemistry and Photobiology (Biology Section)
Journal of Selected Topics in Quantum Electronics
Journal of Clinical Laser Medicine and Surgery
Journal of Clinical Investigation
Journal of Peripheral Neurology
Expert Review of Neurotherapeutics

INVITED SEMINARS AND LECTURESHIPS, PUBLICATIONS AND COMMITTEES

Since 1979 I have presented at 38 seminars and international conferences, have over 57 publications. Currently I am the Director of Graduate Program for Anatomy, Physiology and Genetics, Chairman of the Graduate Advisory Committee and Member of the Search Committee for APG Faculty Positions. I am on the Graduate Education Committee, Laser Safety Committee and Research Proposal Merit Review Committee.

Jan M Bjordal

Jan M. Bjordal was trained and authorized as a physical therapist in 1982. After 15 years of clinical practice with Low Level Laser Therapy (LLLT) he started his academic career and received his master (1998) and doctoral (2003) degrees from University of Bergen, Norway. He became a full professor at Bergen University College and University of Bergen in 2007, and he is a visiting professor at Leeds Metropolitan University from 2008. During 2000-1 he was appointed leader of the Specialist Board in The Norwegian Physical Therapy Association, and he was their advisor in the negotiations where LLLT was approved for physical therapy use by the Norwegian Ministry of Health in 2001.

His research interests range from animal studies of inflammation to clinical studies and systematic reviews in musculoskeletal disorders. His main contribution to the LLLT literature has been to identify optimal dose ranges (therapeutic windows) for the different biological mechanisms by which LLLT works.

Dr. Bjordal has held 21 invited international lectures, and 29 of his articles can be found in international peer-review journals like British Medical Journal, European Journal of Pain and the three laser journals Photomedicine and Laser Surgery, Lasers in Surgery and Medicine and Lasers in Medical Science.

He is peer-reviewer of 16 international journals and he has been external referee for several Cochrane reviews. His research interest also includes non-steroidal anti-inflammatory drugs and other painkiller drugs used for arthritis. In 2004 he was leading an expert group of researchers in a Health Technology Assesment inititated by the Ministry of Health in Norway. The HTA report

concluded LLLT was effective in the treatment of knee osteoarthritis if appropriate doses were given. In 2004 he was appointed Scientific Secretary to World Association for Laser Therapy, and he has been leading the development of WALT standards for conduct of clinical trials and systematic reviews and the WALT guidelines for recommended dosage of LLLT in musculoskeletal disorders. He is in the editorial boards of Photomedicine and Laser Surgery, Physical Therapy Reviews and Revista Fisioterapia Brasileiro, Revista Laser Brasileiro and The Open Orthopedic Journal. His clinical background makes him capable of popularising complex research findings and relate them to key clinical issues in plain language.

Paul Bradley

Dr Bradley is Professor and Vice Chairman of Oral Diagnostic Sciences at Nova Southeastern University at Fort Lauderdale, Florida. He is Director of the Orofacial Pain Clinic there, where Low Intensity Laser Therapy (LILT) is an important treatment modality and subject for research. In 2005, he was President of the North American Association for Laser Therapy (NAALT) , hosting the Annual Conference at Nova. Dr Bradley is the editor of a text book on Cryosurgery and over 60 publications, including 12 chapters in text-books, concentrating on minimally invasive surgery and lasers. Before moving to the USA four years ago, he was Professor and Chair of Oral and Maxillofacial Surgery in the Universities of London and Edinburgh. He was recipient of the Down Medal for outstanding service to Oral and Maxillofacial Surgery.

Aldo Brugnera Jr

Emeritus Professor at the Camilo Castelo Branco University
Doctor in Dentistry – Federal University of Rio de Janeiro – UFRJ- Brazil
Senior Editor of the Journal Photomedicine and Lasertherapy – USA
Secretary General of the World Federation for Lasers in Dentistry-WFLD
Past President of WALT- World Association for Laser Therapy (www.walt.nu)
Over 50 international papers published in the area of laser and over 200 national and international conferences held on the subject
Author of 4 books in the area of Laser in Dentistry and author of various chapters in other publications
1 book published abroad:
Atlas of Laser Therapy Apllied to Clinical Dentistry, Ed Quintessence,1a Ed, 2007

Roberta Chow

Dr Roberta Chow is a general practitioner currently in practice at Castle Hill Medical Centre, Castle Hill Sydney. She has used lasers for pain management and wound healing in her practice since 1988. Her interest in lasers has grown over the last 17 years culminating in PhD studies of laser therapy, in the Faculty of Medicine, the University of Sydney. The PhD has focussed on 830nm laser in neck pain and possible neurally-based mechanisms of action.

Publications:

- Chow RT. Dose Dilemmas in Low level Laser Therapy - The Effects of Different Paradigms and Historical Perspectives. Laser Therapy 13, 102-109. 2001.

- Chow RT. and Armati PJ. The effects of 830nm Laser on Cultured Rat Dorsal Root Ganglia: Implications for the Analgesic Effects of Laser. Lasers in Surgery and Medicine Suppl 6:5. 2004
- Chow RT., Barnsley LB., Heller GZ PhD, and Siddall PJ. Efficacy of 300mW, 830nm Laser in the Treatment of Chronic Neck Pain: a Survey in a General Practice Setting. Journal of Musculoskeletal Pain 11(3) 13-21. 2003.
- Chow RT, Barnsley LB, Heller GZ PhD, and Siddall PJ. A Pilot Study of Low-Power Laser Therapy in the Management of Chronic Neck Pain. Journal of Musculoskeletal Pain 12(2) 71-81. 2004.
- Chow, R.T. and Barnsley, L., A Systematic Review of the Literature of Low-Level Laser Therapy (LLLT) in the Management of Neck Pain. Lasers in Surgery and Medicine 37(1) 46-52. 2005

Michelle Copeland

EDUCATION:
1970 - B.A.New York University, College of Arts and Science, New York, NY
1977 - D.M.D. Harvard School of Dental Medicine, *Magna Cum Laude* Boston, MA
1980 - M.D.Harvard Medical School, Boston, MA
PRESENT APPOINTMENTS:
1997- Present: Assistant Professor of Clinical Surgery, Mount Sinai School of Medicine, City University of New York
1985 -Present: Assistant Attending Surgeon in Plastic Surgery, Mount Sinai Medical Center, New York, NY
1998 – Present: Assistant Attending Surgeon in Plastic Surgery, Manhattan Eye, Ear & Throat Hospital New York, NY
1995 -2000: Consultant, Pathways Women's Health, Manhasset, NY
SOCIETIES:
American Association for Accreditation of Ambulatory Surgery Facilities
American College of Surgeons
American Medical Association
National Committee on Domestic Violence
American Medical Women's Association
Women's Medical Association of New York City
American Society of Maxillofacial Surgeons
American Society of Plastic Surgeons
Women Plastic Surgeons' Caucus
American Society for Aesthetic Plastic Surgery
American Society for Laser Medicine and Surgery
Association of Women Surgeons
Harvard Odontological Society
Health, Medicine and Research Partners (HMR Partners) of the
Society of Women's Health Research
Lipoplasty Society
New York County Medical Society
New York Regional Society of Plastic and Reconstructive Surgery
New York Surgical Society
Northeastern Regional Society of Plastic Surgeons
Omicron Kappa Upsilon, National Dental Honor Society

PUBLICATIONS

First author in 8 articles in accredited peer-reviewed journals
First author in 5 clinical reports
First author in 3 books

INSTITUTIONAL LECTURES

1. Mount Sinai Medical Center - Comprehensive Geriatric Medicine: Pressure Ulcers, September 18, 1998
2. Mount Sinai Medical Center - Educational Seminar: The New Techniques in Plastic Surgery, October 9, 1997
3. Grand Rounds: Mount Sinai Medical Center, Topic: The Breast Reconstruction, December 1995
4. Committee of 1000: Reconstructive/Plastic Surgery, December, 1995 and January, 1997
5. Grand Rounds: Mount Sinai Medical Center, Topic: Sternal Wound Reconstruction, Fall 1995
6. Decubitus Ulcers: Nursing Staff of Mount Sinai Medical Center, 1995
7. Wellness Lectures: Cosmetic Surgery, 1993

NATIONAL TELEVISION AND RADIO APPEARANCES

1. WCBS, Morning Show, 2007
2. ABC, Good Morning America 2001, 2002, 2003, 2004, 2005, 2006
3. The View, 2005, 2006
4. Dr. Keith Ablow, 2006, 2007
5. Inside Edition 1999, 2000, 2001,2005
6. Shop NBC 2005, 2006, 2007
7. NBC, Today Show 2000, 2003
8. NBC Morning Show 2003
9. Joan Hamburg Morning Talk Show 1998, 1999, 2003
10. Satellite Radio, 2003,2004, 2007
11. Fox News 1997, 1998, 1999, 2002, 2004
12. News 12 Westchester 2003

Mary Dyson

Mary Dyson PhD is Emeritus Reader in the Biology of Tissue Repair at King's College (KCL), University of London, UK. She is a biomedical consultant, co-founder and director of Quality Medical Instruments Ltd, and Executive Vice-President of Longport Inc.

Mary joined the Department of Anatomy, Guy's Hospital Medical School, now part of King's College London (KCL), as a Research Associate in 1964, and taught Gross Anatomy and Histology there from 1970 until her retirement in 1998. She founded the Tissue Repair Research Unit in 1987 and was its Director until 1998. From 2001 until 2003 she was part-time Visiting Professor in the Department of Physical Therapy and Rehabilitation Sciences, School of Allied Health, Kansas University Medical Centre.

Mary is one of the inventors of a high-resolution ultrasound scanner, the patent for which was acquired by Longport Inc from the University of London. She is the author of over 100 research publications in peer-reviewed journals, is one of the editors of the 37th and 38th editions of Gray's Anatomy, and has contributed to textbooks on wound healing, physiotherapy and ultrasound.

She lectures internationally and has presented over 200 invited presentations on topics which include diagnostic and therapeutic ultrasound, laser therapy, wound healing, tissue repair and regeneration, injury and repair-related aspects of sports medicine. She has been awarded Honorary Fellowships by the Chartered Society of Physiotherapy and the American Institute of Ultrasound in Medicine and an Honorary Doctorate by the Pennsylvania College of Podiatric Medicine. She was President of the International Laser Therapy Association (ILTA) from 1992-1994,

is a founder, life member and Fellow of the World Association for Laser Therapy (WALT) and a life member of the North American Association for Laser Therapy (NAALT).
Mary is a member of the Lions Club of Berkhamsted and Dacorum Environmental Forum. She is also Chairman of Berkhamsted Patients' Medical Fund.

Chukuka S Enwemeka

CURRENT POSITION

Dean and Professor School of Health Professions, Behavioral & Life Sciences

HIGHER EDUCATION

1985 Ph.D. Pathokinesiology, New York University, New York, NY
(Degree requirements completed in 1984; degree awarded in 1985)
1983 M.S.Musculoskeletal Physical Therapy, University of Southern California, Los Angeles, CA
1978 B.Sc. Physiotherapy, University of Ibadan, Nigeria *(Formerly University of London, Ibadan Campus)* Graduated With Upper Class Honors.

POST DOCTORAL TRAINING

1985-86 Tissue Culture Research Laboratory, Rusk Institute of Rehabilitation Medicine New York University Medical Center, New York.

BOARD CERTIFICATION AND LICENSURE

1983 PT License No. 11783 California Board of Medical Quality Assurance
1984 PT License No. 2981 New Jersey Board of Medical Examiner
1989 PT License No. 4053 North Carolina Board of Physical Therapy Examiners
1990 PT License No 6081 Florida Division of Medical Quality Assurance (Active)

PUBLICATIONS / PRESENTATIONS / WORKSHOPS

Over 250 Peer-reviewed original publications in accredited journals, Books & Monographs, Peer-reviewed Conference Proceedings & Invited Papers and Teaching Manuals.
Presented over 90 International Presentations, Lectures, Seminars and Workshops and 60 National and Regional Presentations, Lectures, Seminars and Workshops.
Received 9 appointments to review boards, related panels & non-university committees.
Received various honors and awards.

EDITORIAL BOARD & RELATED APPOINTMENTS

1. Co-Editor-in-Chief, *Photomedicine and Laser Surgery*, The Official Journal of the International Society for Laser Surgery and Medicine and The World Association for Laser Therapy, June 2004 to date.
2. Editor-in-Chief, *Laser Therapy*, The official Journal of the World Association for Laser Therapy, May, 2000 to January, 2004.
3. Co-editor-in-Chief, *Laser Therapy*, The official Journal of the World Association for Laser Therapy, since April, 1994 – May, 2000.
4. North America Regional Editor, *Laser Therapy* (July, 1991- April 1994).
5. Associate Editor, *Journal of the Nigerian Society of Physiotherapy* (1987-1989)
6. Editorial Board Member, *Journal of Orthopaedics and Sports Physical Therapy* (1988-1991)
7. Peer Reviewer, *Journal of Applied Physiology,* (2006 to date).
8. Peer Reviewer, *Laser Chemistry,* (2006 to date).
9. Peer Reviewer, *Journal of Biomedical Optics,* (2006 to date).
10. Peer Reviewer, *Lasers in Surgery and Medicine,* (2002 to date).
11. Peer Reviewer, *Photochemical and Photobiological Sciences,* (2005 to date).
12. Peer Reviewer, *British Journal of Sports Medicine,* (2005 to date).

13. Peer Reviewer, *Cell Biology International,* (2005 to date).
14. Peer Reviewer, *Photochemistry and Photobiology,* (2005 to date).
15. Peer Reviewer, *Physical Therapy* (1988-1992).
16. Peer Reviewer, *Physiotherapy Canada*(1988-1992).
17. Peer Reviewer, *Journal of Orthopaedic & Sports Physical Therapy* (1988-1992).

MEMBERSHIP IN SCIENTIFIC & PROFESSIONAL ORGANIZATIONS

- American Society for Laser Medicine and Surgery (ASLMS), 2006 to date.
- World Association for Laser Therapy (formerly, International Laser Therapy Association) (1990 to date) served as President from 1998 to 2000; Life Member since 2000.
- American Physical Therapy Association (APTA), 1983 to date
- American College of Sports Medicine (ACSM), 1985 to date; (became a Fellow in 1991).
- American Association for the Advancement of Science (AAAS), 1985 to 1998.
- American Society of Biomechanics (ASB), 1988 to 1999
- International Society for Laser Surgery and Medicine (ISLSM), 1989 to date
- American Physiological Society (APS), 1990 to 1998
- American Society for Gravitational and Space Biology (ASGSB), 1990 to 1997
- American Association of University of Professors (AAUP), 1993 to 1997
- American Rural Health Association, 1993 to 1996.

Denise H Evans (nee Hawkins)

Highest Qualification: D. Biomedical Technology (2007)
Affiliation: Post-doctorate research fellow, Laser Research Group, University of Johannesburg, South Africa
Funding received: NRF/NLC student scholarship (2003-2006), University of Johannesburg student bursary (2003-2006), NRF Innovation fund post-doctorate fellowship (2007-2009)
Research area:Wound healing, cell stress, senescence, mitochondrial responses, second messengers, proliferation, keratinocytes,
Publications: 18 first author publications (2003-2008)
6 co-author publications (2005-2008)
Conferences: Local (South Africa) – 20 (2003-2008)
International – 8 (2003 – 2008)

Workshops: Local (South Africa) – 22 (2003- 2008)
International – 4 (2003- 2008)

External reviewer: Lasers in Surgery and Medicine - 8 manuscripts (2007 – 2008)
Future Drugs – 1 manuscript (2007)
African journal of Biochemistry Research – 2 manuscripts (2008)

Student supervision: 2 B.Tech students (graduated 2005), 1 M.Tech student (graduated 2006), 2 M.Tech students (current 2008), 1 D.Tech student (current 2008)

Awards/other: Received medal for outstanding achievement, University of Johannesburg 2003

- Best Postgraduate Student 2004, University of Johannesburg Vice Chancellor's research prize, 2003
- Received a joint award at the International Workshop on Optics and Promotion of Laser Applications (Namibia, 2003) for the Best Young Women in Science, 2003.
- Faculty of Health Sciences – Best poster presentation for Faculty of Health Sciences Research Day, 2004

- THOR laser Therapy Course on the application of Low Level Laser and LED Therapy, the physiological mechanisms, dosage, treatment techniques and contra-indications (5.5 hours CPD points), 2005.
- 57th Lindau Nobel Laureate Meeting - 57th Meeting of Nobel Prize Winners (19th Physiology and Medicine), Germany. Nominated by Mmboneni Muofhe, Manager: Strategic Partnerships, Department of Science and Technology (South Africa) and accepted to attend the meeting in a competition where only 568 students are invited throughout the world from approximately 20 000 nominations.
- Member of the World Association of Laser Therapy (WALT) 2008 conference organising committee and Chairperson of the WALT 2008 Fundraising committee.

Work experience: Lecturing (Immunology, Haematology, Biochemistry, Epidemiology) – 10 classes (2003-2008)
Moderator (Biochemistry and Epidemiology) – 2007
Research Assistant, Laser Research Group, Faculty of Health Sciences, University of Johannesburg (2006 – 2008)

Premysl Fryda

European Medical Laser Association, Chief Executive Oficer (CEO)

Professional career after the secondary school started as an English-Czech translator and interpretor in the administration. Having finished law university studies in 1986 he held the position of a Consular Officer at the Czechoslovak Embassy in Stockholm, Sweden. In 1989 appointed Editor-in-Chief of the Traffic Police Broadcast in the Czechoslovak Radio. In 1992 setting up a Law Consultancy Firm (Senior Partner) Fryda, Chudomelova, Albrecht and Co., shortly after that appointed Associated Property Partner in McKenna & Co. Solicitors, UK. Experience in laser medicine gained in the position of Director for International Marketing and Sales in a laser manufacturing company (1992 - 2004). Specialized in internal auditing, quality management systems (ISO 9001:2000) and information security management (ISO 2701:2005) in medicine. Publishing and lecturing in the fields of safety in laser medicine, ethical and legal issues of transplantations. Six years experience as Editor-in-Chief of international Laser Partner Magazine. Member of the Czech Association for Medical Law, member of the Board of the Czech Society for the Use of Laser in Medicine, member of the European Platform on Ethical, Legal and Psychological Aspects of Organ Transplantation, Chief Executive Officer of the European Medical Laser Association.
Languages: English, Czech, Slovak, Russian.
Hobbies: hiking, travel, literature, joinery.
Married, two daughters.

Elaine Hill

Dr Elaine Hill is not only a dedicated mother of three but also a founder and practicing veterinarian at both Mayville and Bergsig Animal Clinic in Pretoria and is involved in the management of Pet 911, an Emergency Veterinary Clinic in Pretoria. She graduated with a BSc in 1983 and followed with a BSc Honors in 1984 and a HED from Unisa in 1986. She furthered her studies and graduated as a veterinarian in 1992 from Onderstepoort Veterinary Faculty at the University of Pretoria and has been practicing veterinary science ever since. What started as a small one man practice in Mayville grew to become a four man, two clinic and after hours facility. She became involved with the use and application of phototherapy in 2004 and has since been working extensively with this new and exciting treatment modality. Together with her two partners she started Vet-Light, a company specializing in the marketing and promoting of phototherapy devices.

Lars Hode

Education Summary

Secondary:	1953-1959:	Högre Allmänna Läroverket å Kungsholmen
Practical Education:	1959-1960:	AGA Workshop School,
Third Level:	1960-1963:	Thorildsplans Tekniska Gymnasium, Electronic Engineering
Military Education:	1963-1964	Radio Technical Engineering
Fourth Level:	1966-1971	Royal Institute of Technology, Maser of Technology, Physics
Fifth Level:	1971-1975	Institute of Optical Research, D.Sc. Theses: Real Time Speckle Interferometry. Specialty: Optical radiation and its applications in medicine.

Work Experience

1964-1966	Employment as electronic engineer in Tetra Pac AB in Lund, Sweden
1975-1978	Employment as patent engineer in Stockholms Patentbyrå, Sweden
1978-1983	Employment as Bureau Director in, Department of Countermeasures of the Swedish Air Force Material Administration (FMV), Stockholm, Sweden
1983-Now	Scientific advisor for Spectro Analytic AB, Stockholm, Sweden
1989-Now	Working chairman of Swedish Laser-Medical Society (SLMS)

Books:

Hode L. Optisk Resurskatalog. Ed I. 1981. Styrelsen för Teknisk Utveckling. Stockholm, Sweden.
Hode L. Optisk Resurskatalog. Ed II. 1989. Styrelsen för Teknisk Utveckling. Stockholm, Sweden.
Tunér J, Hode L. Dental laserbehandling. 1992. Svenska Laser-Medicinska Sällskapet, Stockholm
Tunér J, Hode L. Lågeffektslaser i odontologin. 1995. Sv Laser-Medicinska Sällskapet, Stockholm.
Hode L. Laser som läker. 1996. Swedish Laser-Medical Society, Stockholm, Sweden
Hode L. Laser - der heilt. 1996. Swedish Laser-Medical Society, Stockholm, Sweden
Hode L. The Laser That Heals. Swedish Laser-Medical Society, Stockholm, Sweden
Tunér J, Hode L, Diklic S. Laser u Stomatologiji. 1996. Novi Sad, Yugoslavia.
Tunér J, Hode L. Osnove Primene Lasera u Medicini. 1996. Novi Sad, Yugoslavia.
Tunér J, Hode L. Laser Therapy in Dentistry and Medicine. 1996. Prima Books, Sweden.
Tunér J, Hode L. Low Level Laser Therapy, Clinical Practice and Scientific Background. 1999. P-B, Swe.

Tunér J, Hode L. Laser therapy, clinical practice and scientific background. 2002. Prima Books, Sweden.
Tunér J, Hode L. The laser therapy handbook. 2004. Prima Books, Sweden.
Tunér J, Hode L. Low Level Laser Therapy, Clinical Practice and Scientific Background. In Korean language.
Hode L, Lasers that heal. 2007. Swedish Laser-Medical Society, Stockholm, Sweden
Hode L, Tunér J. Phototherapy - Light as a Medical Tool. 2007 (in print), Prima Books, Sweden.

Nicolette N Houreld

Highest Qualification: D. Biomedical Technology (2007)
Affiliation: Post-doctorate research fellow, Laser Research Group, University of Johannesburg, South Africa
Publications: 8 first author publications (2004-2008)
5 co-author publications (2005-2008)
Oral Conference Presentations: Local (South Africa) – 8 (2000-2008)
International – 4 (2003 – 2008)
External reviewer: Diabetes Technology and Therapeutics (2007)
Student supervision: 2 B.Tech students (graduated 2005), 3 M.Tech students (current 2008), 1 D.Tech student (current 2008)

Awards/other:
- Bayer Student Award for best Chemical Pathology Student 1998
- Best Woman in Science (joint award), International Workshop on Optics and Promotion of Laser Applications 2003
- Vice Chancellor Special Research Award – Best Postgraduate Student (Joint Award) 2004
- Member of the World Association of Laser Therapy (WALT) 2008 conference organising committee.

Work experience:
Lecturing: Faculty of Health Sciences, University of Johannesburg
Chemical Pathology IIA (N.Dip biomedical technology) 2001
Biochemistry II (N. Dip homeopathy and chiropractic) 2001
Chemical Pathology IIB (N.Dip biomedical technology) 2003
Microbiology Theory I (N.Dip podiatry) 2003 – present
Haematology II (N.Dip biomedical technology) 2007
Other: Medical Laboratory Technologist (DDM Laboratory Services Technikon Witwatersrand) 1999 - 2000
Research Assistant, Laser Research Group, Faculty of Health Sciences, University of Johannesburg (2007 – present)

Gerd Keiser

EDUCATION

- Northeastern University, Boston, MAPh.D. Physics
- University of Wisconsin, Milwaukee, WIB.A. & M.S. Physics

UNIVERSITY TEACHING (2005 - PRESENT)

- National Taiwan University of Science and Technology (NTUST); Taipei, Taiwan

Professor: Graduate Institute of Electro-Optical Engineering, Department of Electronic Engineering

- Boston University (Adjunct Professor)
  Electrical and Computer Engineering Department

CONSULTING ACTIVITIES (2000 - present)

- PhotonicsComm Solutions, Inc. (Founder and Principal Consultant)
  Consulting in Telecommunication System Engineering

PROFESSIONAL EXPERIENCE (Before 2000)

- General Dynamics/GTE Systems Corp (Telecom Applications Leader)
  Strategic Planning in Photonics Technology
- Telecommunication System Engineering
- Technology Applications Engineering

PROFESSIONAL ACTIVITIES

- 2004/2005 Chair, Central New England IEEE Laser & Electro-Optics Society (LEOS); currently on the Technical Planning Committee
- Executive Committee Member of the New England Chapter of SPIE (2003/2004)
- Associate Editor of the technical journal *Optical Fiber Technology* (Elsevier)
- Consulting editor of the *Wiley Encyclopedia of Telecommunications*, John G. Proakis, Ed. in Chief, Wiley, 2003
- Book manuscript reviewer for McGraw-Hill, Wiley
- Technical paper reviewer for IEEE, SPIE, and Elsevier journals
- Organizer and chair of technical sessions for IEEE MILCOM conferences
- Organizer and chair of the First International Biophotonic Sciences (IBiS) Workshop

PUBLICATIONS / PRESENTATIONS

Text Books

1. *Optical Fiber Communications*; McGraw-Hill; 1st ed. 1983; 2nd ed. 1991, 3rd ed. 2000, 4th ed. 2008. The 1st edition was translated into Japanese; the 3rd edition was translated into Chinese.
2. *Local Area Networks*: McGraw-Hill; 2nd ed., 2002. Was translated into Italian.
3. *Optical Communications Essentials*; McGraw-Hill; 2003
4. *FTTX Concepts and Applications*; Wiley; 2006

Journal and Conference Papers

Over 43 papers in peer-reviewed journals and conference proceeding books.

Invited Conference Keynote Speeches and University Seminars

From 2001 to 2007 I have spoken at 12 conferences, as a keynote speaker, and University seminars.

SHORT COURSES FOR CONFERENCES AND INDUSTRY

From 2001 to 2008 I have done 23 short courses for various conferences and industry.

Bhimanakunte Krishna Rau

Bhimanakunte Krishna Rau was born in 1939, graduated as MBBS from Madras University in 1960; first in his year with distinction, wining Johnston Gold Medal and best outgoing MBBS. Five years later he was qualified as a Master of Surgery in 1965 and then FRCS of Edinburgh and of England of the same year in 1967. He was awarded an Honorary FRCS from the Royal College of Surgeons Thailand in 2005. He was recently elected as Honorary Fellow of the American Surgical Association. He is the first Indian to receive this honour in the association's 127 years of history.
He has been very proficient in both surgery and Medicine, earning several Gold Medals and Awards, namely Dr. Masilamani Medal, Chipper fields Gold Medal, Dr. Nair's Gold Medal, Dr. Rangachari's Gold Medal and Alan Evan's Grant Prize.
Prof. Rau is specialized in Gastro-Intestinal Surgery, Therapeutic Gastro-Intestinal Endoscopy, Laser and Laparoscopic Surgery. Technically he is a pioneer in several fields. For this merit he won Craftsman Award in 2004, Sharada Memorial Life Time Achievement Award 2000 and Dr. B.C. Roy National Award in 1997.
As an Orator he was called upon on several important medical and surgical events: recently in 2004 second IMGIM Sisco Pentax Oration on "Has Therapeutic Endoscopy altered Surgical Approach to Gastro-Intestinal Diseases" in Chennai, India and in 2003, the fourth Dr. L.S. Sastry Memorial Oration "Laser and the Surgeon" Bezwada Medical Association and Indian Medical Association Vijayawada, India.
He has published more than 200 publications in International and National Journals. He has been on editorial boards on several important academic journals and also on examination board of both undergraduate and postgraduate of Madras University and University Sains, Malaysia.
He is now Professor Emeritus Tamil Nadu Dr. MGR Medical University, India. He has been closely associated with the Faculty of Medicine, Khon Kaen University for several years, since 1996: a regular guest speaker of the International Postgraduate course of the International Association of surgeons and Gastroenterologists, Thai Chapter, a visiting Professor, lecturing and demonstrating to staffs and postgraduate trainees, especially in the field of therapeutic endoscopy.

Liisa Laakso

Dr Liisa Laakso is a Senior Lecturer in the School of Physiotherapy and Exercise Science, Griffith University (Gold Coast campus) and has been there since July 2002. Prior to that she had been employed in a conjoint position - as a Senior Physiotherapist in the Physiotherapy Services, Royal Brisbane and Royal Women's Hospital Health Services District; and as a Lecturer in the Department of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland.
Clinical areas of interest include critical care, sports physiotherapy, chronic pain management and oncology/palliative care.
She completed her PhD in 1995 (investigating the role of therapeutic laser in the management of chronic pain) having received a Sir Robert Menzies Memorial Scholarship to pursue those studies
Research interests in the field of laser therapy include its role in healing and repair of tissue, inflammation and pain, the management of lymphoedema, and the effect on tumours.
Selected publications:

- Laakso, E-L and Cabot PJ (2005) Nociceptive scores and endorphin-containing cells reduced by Low-Level Laser Therapy (LLLT) in inflamed paws of Wistar rat. Photomedicine and Laser Surgery, 23:32-35.
- Laakso, L., Richardson, C. and Cramond, T (1997) Pain Scores and Side Effects of Low Level Laser Therapy in the Treatment of Myofascial Trigger Points. Laser Therapy, 9:67-72.
- Laakso, L., Richardson, C. and Cramond, T. (1993) Quality of light - is laser necessary for effective photobiostimulation Australian Journal of Physiotherapy, 39:87-92.
- Laakso, L., Richardson, C. and Cramond, T. (1993) Factors affecting low level laser therapy. Australian Journal of Physiotherapy, 39:95-99.

Rodrigo A B Lopes Martins

Dr. Rodrigo Alvaro B. Lopes Martins is a Professor at the Department of Pharmacology , Institute of Biomedical Sciences at the University of São Paulo. He had a Master Degree in Pharmacology at the Medical School of the State University of Campinas in 1994. His PhD thesis was finished in 1998 in Cell and Molecular Biology at the Oswaldo Cruz Foundation, and a Pos-Doctoral training in Pharmacology at the State University of São Paulo.

Dr. Lopes-Martins Has been working with Low Level Laser Therapy since 2002, using a pharmacological approach in order to elucidate the anti-inflammatory mechanism of Laser Therapy. During this period he was able to publish several medline-indexed papers in this area.

In the last years his main research area is the study of laser therapy in experimental models of musculo-skeletal inflammatory disorders such as osteoarthritis, tendonitis and muscle strain, as well as, clinical implications of the therapy.

Kevin C Moore

Consultant in Anaesthesia & Pain Management
The Royal Oldham Hospital, Oldham, UK
Medical Director, Dr Kershaw's Hospice, Oldham UK
Life Member of WALT
Hon Treasurer and member of Executive Council, WALT
20 years experience in clinical research into Laser Therapy for:-

-Treatment of chronic pain syndromes
-Acute trauma and sports injuries
-Post Herpetic Neuralgia

Author of many book chapters and peer reviewed research papers
Member of editorial board of "Photomedicine and Laser Surgery"

Ester M D Nicola

Post Graduation Studies:

- M. D. Degree obtained in 1970 from the Medical School, Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil
- Fellowship at ENT Department , Medical School, Colorado University, Denver, Co, 1977- 1978
- Internship at ENT Department, Medical School, Federal University of Rio Grande do Sul, Porto Alegre, Brazil, 1971 – 1972
- ENT Specialist, Medical School, Federal University of Rio Grande do Sul, Porto Alegre, Brazil, 1974.
- Ph.D. (Medicine), Medical School, State University of Campinas, Campinas, SP, Brazil, 1984.

Present Activity:

- Full Professor- ENT Department, Medical School, State University of Campinas, Campinas, SP, Brazil
- Responsible for the Post Graduation Activities at the ENT Department, Medical School, State University of Campinas, Campinas, SP, Brazil

Other Activities

- Head of Laser Laboratory at the Clinical and Experimental Medical Center of the Medical School, State University of Campinas, Campinas, SP, Brazil
- Head of the Multidisciplinary Laser Center at the Clinics Hospital, State University of Campinas, Campinas, SP, Brazil.
- Professor of Neurosciences Post Graduation Course and General Medicine Post Graduation Course, Medical School, State University of Campinas, Campinas, SP, Brazil.

Expertise :

- Laser applied to Medicine and Biology
- Clinical and Surgical Laser procedures applied to ENT and Oral Cavity.
- Photo Dynamic Diagnoses (PDD) and Photo Dynamic Therapy (PDT)

Tebello Nyokong

Obtained PhD from University of Western Ontario, Canada, 1987. Currently DST/NRF Research Professor of medical chemistry and nanotechnology. Awarded order of Mapungubwe (bronze) by State President Mbeki for contribution to science (2005), winner of SABC2/Shorprite-Checkers Woman of the year in Science and Technology (2004), awarded Rhodes University Vice-Chancellor's distinguished research award (2003), Awarded a Grant-Holder medal from CSIR for being the best NLC grant holder of the year 2005. Rated B(1) by the NRF. Has published over 200 publications including Three book chapters. Sixteen PhD and Eleven MSc students have graduated from the group. Have presented over 200 conference papers (including Sixteen Keynote and Plenary lectures).

Uri Oron

Affiliation: Department of Zoology, George S. Wise Faculty of Life Sciences
Date & place of birth: 1945, Israel

A. EDUCATION:

1966-1969	Tel Aviv University	Biology B.Sc.
1969-1971	Tel Aviv University	Zoology M.Sc.
1971-1977	Tel Aviv University	Zoology Ph.D.

B. FURTHER STUDIES

June 1971	Tromsö University, Norway	Advanced course in Cell Biology

C. ACADEMIC AND PROFESSIONAL EXPERIENCE:

1969-1971	Tel Aviv University	Zoology	Teaching assistant
1971-1975	Tel Aviv University	Zoology	Assistant
1975-1977	Tel Aviv University	Zoology	Instructor
1977-1979	Harvard University	Biology	Research Fellow and Teaching Assistant
1979-1983	Tel Aviv University	Zoology	Lecturer
1983-1993	Tel Aviv University	Zoology	Senior Lecturer
1985-1986	Case Western Reserve University, Cleveland, Ohio, USA	Biology	Visiting Assistant Professor
1993-2002	Tel Aviv University	Zoology	Associate Professor
2002-present	Tel-Aviv University	Zoology	Full Professor
2002-2003	University of California, San-Diego, California, USA	School of Medicine	Visiting Professor

LIST OF PUBLICATIONS (Last 8 years)

1999 – 1 Biochem. Biophys. Acta.
2000 – 2 Basic Res. Cardiol. And Inter. J. Cardiovasc. Interven.
2001 – 10 Am. J. Physiol., Circulation, Laser Therapy, Lasers Surg. Med., J. Am. Coll. Cardiol., Bulletin-Harvard University. Int. J. Cardiol., J. Appl. Physiol., and J. Cell Physiol.,
2002 – 3 Antioxidant. Redox Signa., Cell Science., and J. Proteom. Res.
2003 – 3 J. Clin. Laser Med. Surg., J.Proteom. Res., and . Acta – Mol. Cell Res.
2004 – 2 Mitochondrion and Crystal Growth Desig.
2005 – 3 Photomed. Laser Surg., Photomed. Laser Surg., and Laser Surg. Med.
2006 – 4 Photomed. Laser Surg, Laser Surg. Med., and Stroke.
2007 – 4 Laser Surg. Med., Stroke, J. Neurotrauma., and Photomed. Laser Surg.
2008 – 1 Laser Surg. Med.

Anthony W Parker

Professor Anthony W. Parker is **H**ead of the Lasers for Science Facility group within the Central Laser Facility at Science and Technology Facilities Council's, Rutherford Appleton Laboratory. His scientific expertise is in using lasers for investigating the structure, reactivity and dynamics of chemical and biological processes. He is *Chairman of the Royal Society of Chemistry Fast Reactions in Solution Group*, and a member of several International committees associated with time-resolved vibrational spectroscopy for the promotion of science. He is a founder member of the African Laser Centre Steering Committee responsible for the strategic implementation of lasers on the African continent. He has over 160 publications. In 2002 and 2007 he received

the Meggers award from the USA Applied Optic Society. He has honorary chairs at University College London, University of Salford and the Indian Institute of Science, Bangalore, India in recognition for his work. Between 1999 and 2002 he was Technical Director of a spinout company *LaserThor* working to develop lasers to clean railway lines. At present he is developing a new £1.8M laser system ULTRA, jointly funded by Biotechnology and Biological Sciences Research Council: and Science and Technology Facilities Council, for the UK/EU science community. ULTRA is a novel 10 kHz, 10 W, dual picosecond and femtosecond synchronised laser system tunable from the UV to the Mid IR and it will be used to study fundamental reaction mechanisms of biological important molecules and processes.

Josepa Rigau i Mas

Licentiate in Medicine and Surgery in 1985 at Barcelona University. Ph. D courses in “Method in Biomedical investigation” 1989-1991 and Ph.D. in Medicine and Surgery in 1996 at Rovira i Virgili University with "Action of low level intensity light laser in the cell function modulation".

Academic Activity: Dra. Rigau, from 1995 until 2008, is an adjunct associate professor in Department of Morphology / Histology and Neurobiology Unit, Medical School and Health Science of Rovira i Virgili University (URV), Tarragona –Spain, where is a director of post degree courses of laser in Medicine (Speciality, Master and PhD programs). Engineer Post-degree professor in Biomedical Laser application, in *Pesquisa e Desenvolvimento Institute* at University of *Valle do Paraiba* (UNIVAP), Sao José dos Campos, SP -Brazil. **PhD Work:** in Brazil, 4 thesis of Master degree. In Spain, 7 Diploma of Advance Studies, 2 ready PhD, one of them European mention. At present 5 PhD these are developments.

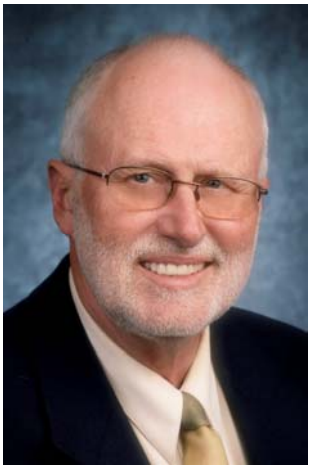
Previous Research Activity: from 86 to 89 responsible of Basic and Experimental Laser Laboratory at Medical Vilafortuny Institute, Cambrils -Spain. From 88 to 92 responsible of Experimental Cell Laboratory at *Antoni de Gimbernat* Foundation, Cambrils -Spain. From 89 to 92 worked in Biological Molecular Unit in Biochemistry Department in Veterinay School at University Autonomy of Barcelona.

Foreign stay: 1991 (6 months) Visiting Assistant Research in Beckman Laser Institute and Medical Clinic at Universidad de California, Irvine (LA) -USA. En 1993 (8 month) Assistant Reserch Lehrinstitut fur Immunologie und Mikrobiologie. München -Germany. Also 8 short foreign stay (less or 3 months) to different centres and countries.

Publish and Congress: authored or co-authored of 70 scientific papers or chapters and presented papers at national (34) and international (81) meetings, including an invitation from at the Joint International Laser Conference, 21-23 September 2003. Edinburgh, Scotland.

Grants: International Society of Lasertherapy Medical-Surgery, Italy in 1989. *Beckman Laser Institute* -USA in 1990 and *Antoni de Gimbernat* Foundation –España in 1994. European Program BIOMED 1990-1994.

Associated: *Sociedad Española de Láser Médico Quirúrgico* (SELMQ), Researcher Vocal in 1997-1999. European Laser Association (ELA), World Association for Laser Therapy (WALT), *Asociación Española de Investigación sobre el Cáncer* (ASEICA), *Sociedad Brasilera de Estética Humana* and *Asociación Aragonesa de Medicina Estética* (AAME).



Gerry Ross

Professional

- Graduated from University of Toronto in 1971
- Practiced in Tottenham from 1971 – present
- Practice 50% general dentistry and 50% facial pain treatment on a referral basis

Organizational

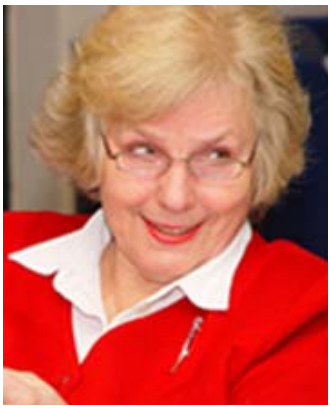
- Current President of the Muskoka Simcoe Dental Society
- Member of the Board of Directors of the Ontario Dental Association (ODA) from 1996 – 2000
- Member of the Board of the Tottenham Chamber of Commerce from 1988 – present
- President of the Tottenham Chamber of Commerce from 2000 – 2001 and currently still a board member

Lecturing Background

- Academy of Laser Dentistry (ALD) meetings, 1996, 1998, 2006 and 2007: Presented primary research and literature reviews
- Cyprus, 2006: Presented paper " Craniofacial Pain for Health Professionals" at the World Association of Laser Dentistry Meeting
- Naalt meeting May 2007 presented research paper "Clinical Study of the use of low level lasers in the treatment of hyperemiaof the TMJ".
- FDA Conference inTomar Portugal, 2007: Presented two abstracts; "Treatment of Craniofacial Pain" and "Summary of dental indications and research abstracts".
- Toronto Academy of Laser Dentistry, 2007: Lecture on Low Level Lasers in Dentistry
- 2007-2008: Continuing lecture series in cities across Canada(15 lectures)

Memberships

- Academy of laser Dentistry – Holds advanced proficiency
- American Society of Lasers in Medicine and Surgery (ASLMS) – Holds fellowship status
- WALT
- NAALT
- Ontario Dental Association
- Canadian Dental Association



Kira A Samoilova

Education

1952 – 1957 Biological Faculty of State University, Leningrad
Diploma: MS, Cytologist
1958 – 1961 Postgraduateship, Institute of Cytology, USSR Academy of Sciences, Leningrad, USSR
Diploma: PhD (Candidate of Biological Sciences) in Cell Biology
1972 – 1979Doctorate, Institute of Cytology, USSR Academy of Sciences, Leningrad, USSR
Diploma: Professorship (Doctor of Biological Sciences) in Cell biology

Positions held

1982 – present Head of Photobiology Group, Institute of Cytology, Russian Academy of Sciences, St. Petersburg, Russia
1974 – 1982 Senior Researcher, Institute of Cytology, Russian Academy of Sciences, St. Petersburg, Russia
1961 – 1974 Junior Researcher, Institute of Cytology, USSR Academy of Sciences, Leningrad, USSR

1957 – 1958 Teacher of Biology, High School, Novgorod, USSR

Field of Investigations

Photobiology (effects of UV and visible light non-photosynthesizing cells), photoimmunology, phototherapy and

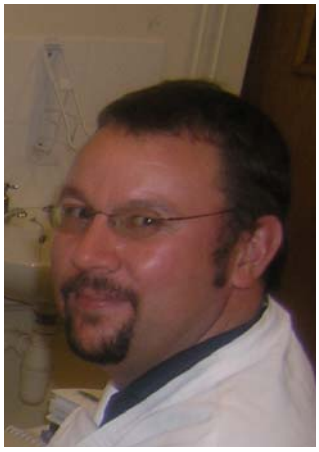
Publications

220 papers in Russian and English, including 2 books (Effect of Ultraviolet light on Cell, 1967; Application of blood photomodification in veterinary medicine, 1989), 11 reviews, 3 inventions, Editore of 7 collective monographies in photobiology and photomedicine.

Scientific Council "Immunology and Allergology" (Institute of Experimental Medicine of Russian Academy of Medical Sciences, St.Petersburg, Russia);

Editorial Board of Journals: Laser Technology, Clinical and Experimental (Milan, Italy), Laser Therapy (Japan), Photobiology and Photomedicine (Kharkov, Ukraine);

Scientific Board of the International Academy for Laser Medicine and Surgery (Florence, Italy) and International Phototherapy Association (IPTA, Japan); Council member of World Association Laser Therapy (WALT, since 2004).



Rob Smith

Dr Rob Smith, a lecturer in the Department of Physiological Sciences at Stellenbosch University, is a basic pharmacologist by training, having obtained his BSc(Hons) degree in Pharmacology at the University of Sunderland (UK) and a PhD in Pharmacology at the University of Bath (UK). Dr Smith has spent time working in the Pharma industry, with stints at Glaxo Group Research and Rhone Poulenc Rorer during his undergraduate and postgraduate degrees. Post-doc work was carried out in the field of cardiac protection at University College, London and then at the University of Cape Town. This led to the development of an interest in the roles played by cytokines and cytokine derived ROS in conformation of a cytoprotected phenotype in muscle. This work has led Dr Smith to become interested in the sources of cytokines in response to stress and injury in muscle. Current research focuses on the roles of cytokines and ROS (both cytokine and laser induced) in muscle repair and regeneration and on the biochemical signaling pathways involved in these responses. This work is currently being carried out using cell and animal (transgenic) based models, but Dr Smith hopes to carry this forward into human subjects in the future. Dr Smiths other academic activities include heading up the cell imaging unit and being an active reviewer for several international journals.

Fernando Soriano

Born in 1951 in Rosario, Argentina. Prof. Dr. Fernando Soriano graduated in 1974 at the Faculty of Medicine in the National University of Rosario, Argentina is specialist in Internal Medicine and Gerontology.

- 1976- 1979: Resident of Internal Medicine at the School Hospital Eva Peron of Granadero Baigorria.
- 1979- 1980: Chief of residents at the same Hospital.
- 1980- 1989: Instructor of Residents at the same Hospital.
- 1985- 1990: Member of the teaching team at the II Cathedra of Internal and Therapeutic Medicine of the National University of Rosario. Argentina.
- 1990- 2000: Professor Adjunct at the same Cathedra of the National University of Rosario

- Director of Instituto Argentino de Medicina Láser (IAMEL). Rosario. Argentina.
- Director of Clínica Florida. Rosario. Argentina
- Member of Executive Committee in different periods: World Association for Laser Therapy (WALT); International Association for Laser in Medicine and Surgery (IALMS); International Association for Laser and Sports Medicine (IALSM); Sociedad Latinoamericana de Medicina y Cirugía con Laser; Asociación Rosarina de Laser en Medicina y Cirugía.
- Member of Editorial Board of Journal of Photomedicine and Laser Surgery.
- Honorary Member of Comisión Nacional de Láser. Ministerio de Salud Pública y Ministerio de Ciencia, Tecnología y Medio Ambiente of Cuba.
- President of Asociación Rosarina de Láser en Medicina y Cirugía 1995.
- President of International Association for Laser and Sports Medicine, 1999.
- Author of more than 150 papers presented at national and international congress.
- Author of 24 scientific papers published in international recognized medical editions.
- Invited speaker in the following countries: Argentina, Paraguay, Uruguay, Brazil, Cuba, México, USA, Spain, Greece, Thailand, India and Japan.

Raymond W Sparrow

MEMBERSHIPS:Institute of Nanotechnology (UK). South African Nanotechnology Initiative.

EDUCATION

LANCASHIRE POLYTECHNIC* 1983-86 PhD. STUDIES IN PHOTOSYSTEM II

PRESTON POLYTECHNIC* 1980-83 BSc.(2.1) COMBINED SCIENCES

SCHOOL/ FE.COLLEGE 1976-79

'A'LEVEL:CHEMISTRY/BIOLOGY/HISTORY

* NOW THE UNIVERSITY OF CENTRAL LANCASHIRE

EMPLOYMENT HISTORY

SENIOR RESEARCHER IN BIOPHOTONICS/ SYNTHETIC BIOLOGY. MARCH 2005 – TO DATE

CSIR, NATIONAL LASER CENTRE/ BIOSCIENCES, PRETORIA, REPUBLIC of SOUTH AFRICA.

Research Group Leader – Bio-energetic transduction Devices. Development of bio-macromolecular machines.

LECTURER: BROMLEY COLLEGE OF F.&H.E. 1992 - 2005

BROMLEY COLLEGE F&HE, ROOKERY LANE, BROMLEY, BR2 8HE. UK

Main duties: Lecturing, course administration (HND Programme Leader of a team of 8 academics), HE curriculum development, Information Learning Technology (ILT) adviser for the Faculty of Science & Technology.

HIGHER SCIENTIFIC OFFICER (STATION 3.1) 1989 - 1991

SRS, DARESBURY LABORATORY, DARESBURY, WARRINGTON, CHESHIRE, WA4 4AD.

RESEARCH FELLOW (POST-DOCTORAL) 1986 - 1989

LANCASHIRE POLYTECHNIC, CORPORATION STREET, PRESTON, LANCASHIRE, PR1 2TQ.

Main duties: Conducting ultra-fast absorption and fluorescence measurements on photosynthetic systems at the Rutherford Appleton and Daresbury Laboratories.

RESEARCH STUDENT: LANCASHIRE POLYTECHNIC1983 - 1986

Main duties: Measuring energy transfer reactions in photosynthetic systems using ultra-fast absorption and fluorescence spectroscopies.
Preparation and analysis of membrane fragments.
Investigation of membrane organisation of the Photosystem II (PS II) complex.

18 Publications

5 Conference abstracts

Ronald Sroka

Born in North-Germany my studies of physics and sports as well as my hobbies showed me the way to the South of Germany. I live in Bavaria since 1986. I am involved in research and development of lasers for medical applications such as Photodynamic Therapy, Thermal and non-Thermal Laser Applications, Diagnostic Procedures. In this field I am leading research groups of different clinical departments (GI, ENT, Urology, Phlebology, Radiology, Pulmonology) of the University Munich. My recent projects in the Laser Research Laboratory of the LIFE-Centre at the University of Munich are the medical applications of high power laser diodes for tissue vaporisation (ENT, Urology), the development of optical biopsy concepts using endoscopes with highest resolution (e.g. CFE, OCT), the application of pulsed high power laser for laser induced shock wave lithotripsy and using lasers for endoluminal irradiation of varicosis veins. Besides I give lectures at the physics department and the medical department of the Universtiy of Munich. There were several research in Switzerland, USA, India and Latvia. I hold several patents of light applications systems, I published several chapters in books containing laser light application in medicine, as well as more than 150 papers in national and international journals. At the university I give lectures as well as I mentor students of physic, biology and medicine to receive their diploma and doctoral thesis.

Iva Tolić-Nørrelykke

Studies

- 1992-1996: Studies of molecular biology, University of Zagreb, Croatia.
- 1996: Bachelor of Science.
- 1997-1999: Graduate studies in biomathematics, University of Zagreb, Croatia.
- 1997-1999: Research assistant in theoretical chemistry, Rugjer Bošković Institute, Zagreb, Croatia.
- 1999: A project on application of nonlinear dynamics to biological systems, with Prof. Erik Mosekilde, Danish Technical University, Lyngby, Denmark.
- 1999-2001: Ph.D. Harvard School of Public Health, Boston, MA, USA.
- 2002, April: defended Ph.D. thesis University of Zagreb, Croatia.

Postdoctoral research

- 2002: *Nano-mechanics of cell division,* with Kirstine Berg-Sørensen, Niels Bohr Institute, Copenhagen, Denmark.
- 2003-2004: *Dynamics of microtubules in fission yeast* and *Effects of altered gravity on single lymphocyte locomotion* with Prof. Francesco Pavone, LENS - European Laboratory for Non-Linear Spectroscopy, Firenze, Italy.

Current research position

- since 2005: Group leader, Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany.

Teaching experience

- 1996-1999: Teaching assistant, Molecular Biophysics, University of Zagreb, Croatia.
- 2002: participating in supervision of Emilia-Laura Munteanu (M.Sc. student).

- 2003-2004: participating in supervision of Roberto Favillini (M.Sc. student), Massimo Galimberti (Ph.D. student), and Leonardo Sacconi (Ph.D. student).
- Currently supervising: Sven K. Vogel and Miguel Coelho (Ph.D. students), Stephan Baumgärtner (Diploma student), Nadine Krüger (B.Sc. student), and Nicola Maghelli (postdoc).

Grants and awards

- 1988 and 1989: First prize, *National Competition in Mathematics*, Croatia.
- 1994: University of Zagreb *Rector's Award*, Croatia.
- 1994-1995: Stipend of the *City of Zagreb* for outstanding students.
- 2001-2002: Grant from *The Danish Natural Science Research Council* for foreign post-doctoral researchers (NATO stipend).
- 2004: Grant from the *European Commission*, Access to Research Infrastructures.

Reviewer for:

- **Journals** (recent): *EMBO Journal*, *Optics Express*, *Physical Biology, Journal of Microscopy, Journal of Mechanics of Materials and Structures, Biochemical and Biophysical Research Communications.*
- **Funding agencies:** Human Frontier Science Program; Wolfson College (Cambridge) Fellowships; Academy of Sciences of the Czech Republic.

Memberships

- American Society for Cell Biology, German Physical Society, Croatian Biophysical Society.

Publications:

Original papers in peer-reviewed journals

1999 – 1 In: Match-Commun. Math. Comput. Chem.
2000 -3 In: J. Chem. Inf. Comp. Sci., Croat. Chem. Act., and J. Theor. Biol.
2001 – 1 In: Proc. Natl. Acad. Sci. U.S.A.
2002 – 4 In: Am. J. Physiol.-Cell Ph.,
2003 – 2 In: Biorheology and Internet Electron. J. Mol. Des.
2004 – 3 In: Comput. Phys. Commun, Phys. Rev. Lett. and Curr. Biol.,
2005 – 4 In: J. Biomech., J. Biomed. Opt., Appl. Opt., and Curr. Biol.
2006 – 3 In: Eur. Biophys., Comput. Phys. Commun., and Biophysical Reviews and Letters
2007 – 1 In: Curr. Biol.

Jan Vandeputte

EDUCATION & TRAINING

- University Nursing and Medicine (1986-1989) & Aggregate HSO/HOKT. K.U.L. (Highest degree)

  End Script:Inventarisatie en literatuurstudie van de technieken wondbehandeling binnen verpleegkunde en het opmaken van een alternatieve procedure. (June 1989), (Wound care procedure for clinical practice within nursing)
- Nursing (1983-1986), Sint Jansinstituut 8000 Brugge
- Industrial engineer (1982-1983) K.I.H. OOSTENDE
- University Biology (1981-1982) K.U.L.
- Bio technique(1975-1981) Sint Jozefsinstituut 8100 TORHOUT
- Master in Wound care and tissue repair, School of Higher education Brussels (2003-2005)

OTHER SKILLS

- Oral presentations at International congresses: Amsterdam (NL, 96), Kenia (97), Harrogate (97),Thailand (97), Pretoria (98), Athens (99), Venetië (99), Stockholm (00), Narobi (00) Granada (01), Pisa (02) Harrogate (03) Paris (04), Harrogate UK (04), Wound UK (05), Brussels (05) Whasa South Africa (05), San Antonio USA (06).
- Organisator of woundcare congres at Medtrade Europe Luxemburg ('98 & '99) en Medtrade Afrika (Johannesburg 98) en Medtrade USA (Atlanta '98).

- Professor at all Flemish universities (Medical faculty) specialized in acute and chronic wound care (from 1996 to date) University of Gent, Leuven, Antwerp, Brussels and Kortrijk
- Chairmen of ICWCS (International Council of Wound Care Societies (2000 to 2002)
- Chairmen of the Clinical Nursing consulting Society from 1995 till 2000
- Vice president of Clinical Nursing and director of scientific comity of Clinical Nursing Consulting (2000 – 2006)
- Member of the Wound care society Belgium & The Netherlands (since 1999)
- Chairmen of Scientific Society of Nursing in Belgium

WORK EXPERIENCE

- CEO CNCI BVBA (Clinical Nursing Consulting International) and 'Chief Product Development' of SanoMed Manufacturing Bv in The Netherlands. CE certification of several medical devices, Extensive record of case reports of all kind of wounds (photographs and patient history)
- 2 years clinical practice in home care setting region West Flanders
- 'Bedside' Consultation for wound care world wide.
- Doctoral Candidate University of Maastricht The Netherlands.
- Infection control manager in St Jozefs hospital Oostend for 7 years
- Three months Neurology, three months Hematology, 2 Year C.A.T. Scan in Sint Jans Hospital Brugge.
- Three months intensive care heart surgery U.Z. Gasthuisberg (July-Sept, 1989)

PUBLICATIONS

Articles in Ligament: 1) de oorzakelijke factoren bij het ontstaan van wound infections,
2) occlusieve dressings, (1990)
3) Nursing education for patients who need diuretic medication (1990)
4) The wound care procedure, (1991)
5) Belang van het werken met procedures in de verpleegkunde.

Articles in the magazine Z.I.P.: 1) Ecology of the human skin. (1992)

Article in the Netherlands: 1) Flemish magazine for Nurses with the title: New accents for Post operative wound care. Practisch bijblijven 1994-2000)

Articles in W.C.S. Nederlands: 1) Idem Ligament & Wondverbanden mogelijkheden en onmogelijkheden- Literatuurstudie (3 delen), Schuimverbanden Case report (1992-1994)

Article in Tijdschrift voor Ziekenverpleging - (Nederland):
1) Verpleegkundige aandachtspunten bij diuretica therapie. (1996)
2) Diabetes voet wonde droog of nat verzorgen?, in Verpleegkunde en gemeenschapszorg (1997).

The Journal American Academy Dermatology. 1998: 1) A Comparative Study of two occlusive dressings in the treatment of deep dermal burn wounds in Pigs.

Article in Burns: 1) Recombinant growth factors or honey?, Burns, 25, 1999, p. 676- 678.

EWMA Journal, September 2003:Clinical Evaluation of L-Mesitran

Book

'Wondzorg' (Wound care) Published by Kluwer, p181, 1999.

PRIZES

- First price for developing infection control protocol funded by Mölnlycke SA.
- First price Ligament 1991, for best scientific article
- Honorable distinction 'Ars Curandi Tibi Decori 1995

RECENT PROJECTS

- Fundamental research wound physiology for doctoral thesis.
- Columnist: Home Health Care Dealer International Magazine California USA in 2000.
- Telemedicine and prototype production telemedicine machine at NASA. (1999 – 2002)
- Consultant for the BBC film; Frontiers of Medicine.
- Development of wound care products and cosmetics.

WALT 2008
PROGRAMME SUMMARY

Sunday 19 October 2008

	ARRIVAL/BOOKING IN ACCOMMODATION		
13:00 – 16:00	REGISTRATION		
17:00 – 18:30	OPENING CEREMONY (Baobab)		
19:30	EVENING WELCOMING FUNCTION (Valley of the Waves)		

Monday 20 October 2008

08:00 – 08:30	REGISTRATION		
08:30 – 09:10	SESSION A: PLENARY LECTURE		
09:15 – 10:35	SESSION A1: Basic Science & Mechanisms of Phototherapy (Tlou)	SESSION A2: Dentistry (Baobab)	SESSION A3: Wound Healing (Tshukudu)
10:35 – 11:05	MORNING TEA (Jacaranda and Acacia Room) POSTER VIEWING		
11:05 – 12:40	SESSION A4: Basic Science & Mechanisms of Phototherapy (Tlou)	SESSION A5: Dentistry (Baobab)	SESSION A6: Wound Healing (Tshukudu)
12:30 – 13:00	GROUP PHOTOGRAPH		
13:00 – 14:00	LUNCH (Sun City Pool Deck/Calabash)		
14:00 – 15:15	SESSION A7: Basic Science & Mechanisms of Phototherapy (Tlou)	SESSION A8: Dentistry (Baobab)	SESSION A9: Wound Healing (Tshukudu)
15:20 – 16:10	AFTERNOON TEA - POSTER VIEWING		
16:15 – 16:45	POSTER SESSION (Baobab)		
16:45 – 18:00	WALT Annual General Meeting (Tlou)		
18:00 – 19:00	Wine tasting (Baobab)		
	FREE EVENING		

Tuesday 21 October 2008

08:00 – 08:30	REGISTRATION		
08:15 – 08:55	SESSION B: PLENARY LECTURE		
09:00 – 10:35	SESSION B1: Photodynamic Therapy (Baobab)	SESSION B2: Tissue Engineering, Stem Cells and Micro-Manipulation Tools (Tshukudu)	SESSION B3: Light-Tissue Interaction & Tissue Optical Properties (Tlou)
10:40 – 11:15	MORNING TEA (Jacaranda and Acacia Room) POSTER VIEWING		
11:15 – 12:50	SESSION B4: Photodynamic Therapy (Baobab)	SESSION B5: Basic Science & Mechanisms of Phototherapy (Tshukudu)	SESSION B6: Light-Tissue Interaction & Tissue Optical Properties (Tlou)
13:00 – 14:00	LUNCH (Sun City Pool Deck/Calabash)		
14:05 – 15:20	SESSION B7: Dermatology, Immunology & Urology (Thutlwa)	SESSION B8: Molecular Imaging & Optical Coherence Tomography (Tshukudu)	SESSION B9: Pain Management (Tlou)
15:25 – 16:00	AFTERNOON TEA (Jacaranda and Acacia Room)		
16:00 – 16:55	SESSION B7: Dermatology, Immunology & Urology (Thutlwa)	SESSION B8: Molecular Imaging & Optical Coherence Tomography (Tshukudu)	SESSION B9: Pain Management (Tlou)
18:30 for 19:00	GALA DINNER (Baobab room)		

Wednesday 22 October 2008

08:00 – 08:30	REGISTRATION		
08:15 – 08:55	SESSION C: PLENARY LECTURE (Baobab)		
09:00 – 10:15	SESSION C1: Physiotherapy, Rheumatology & Laser Accupuncture (Baobab)	SESSION C2: Cardiology & Internal Medicine (Tlou)	SESSION C3: Laser Safety, Dosimetry, Standards, Education & Management (Tshukudu)
10:20 – 10:50	MORNING TEA (Jacaranda and Acacia Room)		
10:55 – 11:10	SESSION C4: Physiotherapy, Rheumatology & Laser Accupuncture (Baobab)	SESSION C5: Cardiology, Internal Medicine & Neurology (Tlou)	SESSION C6: Plastic Surgery, Otolaryngology & Orthopedics (Tshukudu)
13:00 – 14:00	CLOSING OF CONFERENCE LUNCH (Sun City Pool Deck/Calabash)		

WALT 2008 PROGRAMME
Sunday 19 October 2008

	ARRIVAL **CHECK INTO HOTELS**	
13:00	**REGISTRATION - SUN CITY HOTEL**	**(Baobab Room)**
17:00 – 18:30	**OPENING CEREMONY**	**(Baobab Room)**
19:30	**WELCOMING FUNCTION**	**(Valley of the Waves)**

Monday 20 October 2008

08:00	**REGISTRATION**					
08:30 – 09:10	1	**SESSION A** (Baobab Room) ***Recent Advances on the Use of Laser Photobiomodulation on Bone*** A L B Pinheiro *Federal University of Bahia, Salvador, Brazil* *Chair: H Abrahamse* *Co-Chair: A Brugnera Jr*				
	SESSION A1 (Tlou Room) **Basic Science and Mechanisms of Phototherapy** *Chair: J Rigau* *Co-Chair: N Houreld*		**SESSION A2** (Baobab Room) **Dentistry** *Chair: G Ross* *Co-Chair: L Almeida Lopes*		**SESSION A3** (Tshukudu Room) **Wound Healing** *Chair: C Enwemeka* *Co-Chair: R Sparrow*	
09:15 – 09:30	4	***Effect of Laser Irradiation on Mitochondrial Responses of Stressed Keratinocytes*** D H Hawkins Evans, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	21	***LLLT in Dentistry - Scientific Background and Clinical Case Presentation*** A Brugnera Jr, F Zanin, A P Brugnera *Universidade Vale do Paraiba, São Jose dos Campos, São Paulo, Brazil*	32	***The Significance of Treatment Parameters Using Various Photon Sources in Normal and Diabetic Wound and Burn Healing*** F A H Al-Watban, B L Andres and X Y Zhang *King Faisal Specialist Hospital and Research Centre, Riyadh, Kingdom of Saudi Arabia*
09:35 – 09:50	5	***Comparative Study of the Effects of the Use of the CO_2 Laser and Chlorhexidine on the Healing of Cutaneous Wounds Infected by Staphylococcus aureus*** A L B Pinheiro, M A M de Oliveira, A C A Moreira, M D M Costa-Lino, L M P Ramalho *Federal University of Bahia, Salvador, Brazil*	22	***Native Fluorescence of Oral Cavity: Early Diagnosis and Treatment*** E M D Nicola *Campinas State University (Unicamp), Campinas, Brazil*	33	***Low Intensity Laser Therapy Application in Wound Healing*** F Kahn, J Matthews, L Lam *Meditech International Inc, Toronto, Canada*
09:55 – 10:10	6	***Low-intensity Light Therapy: Exploring the Role of Redox Mechanisms*** J R Tafur *University of California, San Diego, USA*	23	***Pain Investigations for Dental Procedures Using Conventional and Laser Modalities*** P Chueh, R Darbar, D Dunn-Rankin, I Rizoiu r *Private Practice, Leighton Buzzard, UK*	34	***Comparative Study of Laser and LED Systems of Low Intensity Applied to Tendon Healing*** J L N Bastos, N A Parizotto, C D Maciel, R F Z Lizarelli *University of São Paulo, São Carlos, Brazil*
10:15 – 10:30	7	***Near Infrared Laser Therapy (810nm) on Lymph Nodes: Effects on Acute Inflammatory Process*** D T Meneguzzo, R Pallotta, L Ramos, S Penna, R L Marcos, S Teixeira, M N Muscará, J M Bjordal, R A B Lopes-Martins, M S Ribeiro *IPEN-CNEN/SP, São Paulo, Brazil*	24	***Lasers and the Dentist*** A Darbar *Smile Creations, Buzzard, UK*	35	***Effects of NIR-LED Light Therapy on Wound Healing*** J Vandeputte *EHSAL, Jabbeke, Belgium*
10:35	**MORNING TEA** (Jacaranda and Acacia Room) **POSTER VIEWING**					

Monday 20 October 2008

		SESSION A4 (Tlou Room) Basic Science and Mechanisms of Phototherapy *Chair: J Anders* *Co-Chair: D Hawkins Evans*		SESSION A5 (Baobab Room) Dentistry *Chair: A L B Pinheiro* *Co-Chair: E M D Nicola*		SESSION A6 (Tshukudu Room) Wound Healing *Chair: F Al-Watban* *Co-Chair: E Hill*
11:05 – 11:20	8	***Effect of Laser Irradiation on Diabetic Wounded Fibroblast Cells In Vitro*** N N Houreld,H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	25	***Phototherapy in Dentistry: Clinical Applications and Case Studies*** G Ross *Tottenham, Canada*	36	***LED Phototherapy Promotes Tissue Repair in Chronic Diabetic and Venous Ulcers*** D G Minatel, K S Caetano, M A C Frade, L A Santana, S C Franca, C S Enwemeka *New York Institute of Technology, New York, USA*
11:25 – 11:40	9	***Signalling Networks and Laser Therapy – Which Ones are Important?*** G van Niekerk, A Karsten, R M Smith *University of Stellenbosch, Stellenbosch, South Africa*	26	***Effects of Continuous and Pulsed Infrared Laser Application on Bone Repair Using Different Energy Doses. Study in Rats.*** L Almeida-Lopes, H Pretel, V Moraes, P Jurgens, L Ramalho, R Sader *NUPEN, São Carlos, Brazil*	37	***Comparison of 633nm Diode Laser Therapy, Regranex and Solcoseryl in Diabetic Burn Healing: Biochemical and Biomechanical Analysis of Scar*** B L Andres, F A H Al-Watban, X Y Zhang and A A Al-Anazi *King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia*
11:45 – 12:00	10	***Optical Fibers for Laser Medicine: A Review*** G Keiser *National Taiwan University of Science and Technology, Taipei, Taiwan*	27	***Diode Laser 660nm in the Prevention and Treatment of Oral Mucositis*** *T Zanin, F Zanin, A Carvalhosa, P H Castro, M Pacheco, A Brugnera Jr* *UNIVAP, São Jose dos Campos, São Paulo, Brazil*	38	***Effect of Blue Light Intravenous Laser on Blood Sugar in Diabetic Type 2 Patients*** N Kazemi-kho, F Dabaghian *Milad General Hospital, Tehran, Iran*
12:05 – 12:20	11	***The Effect of Laser Irradiation on Adipose Derived Stem Cells in the Expression of B-Integrin and THY-1*** J A de Villiers, N N Houreld, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*			39	***Investigating the Variation in Optical Parameters of Low Level Lasers in Diabetic Blood Samples Compared with the Normal Samples*** S Saghafi, F Kashef, S Mokmeli, H Hosseini, R Penjweini *Islamic Azad University, Tehran, Iran*
12:30 – 13:00	**GROUP PHOTOGRAPH**					**(Location to be announced)**
13:00	**LUNCH**					**(Sun City Pool Deck/Calabash Restaurant)**

Monday 20 October 2008

	SESSION A7 (Tlou Room) Basic Science and Mechanisms of Phototherapy *Chair: R Smith* *Co-Chair: N Houreld*		SESSION A8 (Baobab Room) Dentistry *Chair: A Brugnera Jr* *Co-Chair: K Moore*		SESSION A9 (Tshukudu Room) Wound Healing *Chair: J Vandeputte* *Co-Chair:*
14:00 – 14:15	12	***The Absorption Behaviour of Oxygen and the Mitochondrial Energy Transfer – The Importance of Electromagnetic Radiation (Light)*** L Wilden *Private Office for Low Level Lasertherapie, Bad Füssing, Germany*	28	***Evidence Based Laser Periodontics*** A Aragüés *Private practise, Burgos, Spain*	40	***The Effects of Low Power Laser Therapy with Different Wavelenghts in Accelerating Wound Healing on Diabetic Rats*** A Al-Anazi, F A H Al-Watban, X Y Zhang and B L Andres *King Faisal Specialist Hospital and Research Centre, Riyadh, Kingdom of Saudi Arabia*
14:20 – 14:35	13	***Effect of Low Level Laser Irradiation on Pro-Inflammatory Cytokine Expression In Fibroblasts Exposed to Various Insults*** P Sekhejane, N N Houreld, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	29	***Photodynamic Therapy Associated with Conventional Endodontic Treatment in Patients with Antibiotic Resistant Microflora*** A S Garcez, S C Nunez, M S Ribeiro *Faculdade de Odontologia São Leopoldo Mandic, Campinas SP, Brazil*	41	***Phototherapy: The New Ancillary Treatment Modality in Veterinary Practice*** B Goede, E Hill *Vet-Light, Wonderboompoort, Pretoria, South Africa*
14:40 – 14:55	14	***Sperm Motility Enhancement with Low Level Laser and LED Photobiomodulation. A Dose Response Study.*** P Gabel, K Harrison, D Sherrin, J Carroll *THOR Photomedicine Ltd, Chesham UK*	30	***Comparison of the Temperature Changes in Subperiostal Bone and the Risk for Bone Damage During Frenectomies with Electrotom and Er:YAG Laser*** N Parissis, A Manos *Dental School, Aristotle University of Thessaloniki, Thessaloniki, Greece*	42	***Histological Evaluation of the Low Level Laser Effect on Regeneration of Sciatic Nerve in Dog*** D Sharifi, J Gharagouzlou, A R Hajibeglou *University of Tehran, Tehran, Iran*
15:00 – 15:15	15	***DNA Damage and Effects of Phototherapy on Methlypurine DNA Glycosylase*** A B Mbene, N N Houreld, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	31	***Benefits of the Use of the CO_2 Laser in Orthodontics*** S K C Gama, T M de Araújo, A P Valença Neto, A L B Pinheiro *Federal University of Bahia, Salvador, Brazil*	43	***Blue Light Phototherapy Eradicates Methicillin Resistant Staphylococcus aureus (MRSA) In Vitro*** C S Enwemeka, D Williams, S Hollosi, D Yens, S K Enwemeka *New York Institute of Technology, New York, USA*
15:20	**AFTERNOON TEA** **POSTER VIEWING**					**(Jacaranda and Acacia Room)**
16:15 – 16:45	**POSTER SESSION**					**(Baobab Room)**
16:45 – 18:00	**WALT Annual General Meeting**					**(Tlou Room)**
18:00 – 19:00	**Wine tasting sponsored by Vinoteque Wine Bank, Distell (optional activity)**					**(Baobab Room)**
	FREE EVENING					

Tuesday 21 October 2008

08:00	**REGISTRATION**					
08:15 – 08:55	2	**SESSION B** (Baobab Room) ***Laser Phototherapy: A New Modality for Nerve Cell Tissue Engineering Technology, Cell Therapy and Nerve Repair*** S Rochkind *Tel Aviv University, Tel Aviv, Israel* *Chair: J Bjordal* *Co-Chair: J Anders*				
	SESSION B1 (Baobab Room) **Photodynamic Therapy** *Chair: H Abrahamse* *Co-Chair: C Enwemeka*		**SESSION B2** (Tshukudu Room) **Tissue Engineering, Stem Cells and Micro-Manipulation Tools** *Chair: R Sroka* *Co-Chair: R Sparrow*		**SESSION B3** (Tlou Room) **Light-Tissue Interaction and Tissue Optical Properties** *Chair: E-L Laakso* *Co-Chair: M Dyson*	
09:00 – 09:15	44	***Combination Therapy of Cancer Using Laser Light, Red Light Absorbing Dyes and Nanoparticles*** T Nyokong, M Idowu, S Moeno, Jiong Ma, J Y Chen *Rhodes University, Grahamstown, South Africa*	53	***Laser Scissors and Laser Tweezers for Intracellular Manipulations*** I Tolic-Norrelykke *Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany*	58	***Monitoring Real-Time Cellular Uptake of Serotonin using Multi-Photon Fluorescence Lifetime Imaging*** A W Parker, Stanley W Botchway, Roger H Bisby, Ana G Crisostomo *Rutherford Appleton Laboratory, Didcot, UK*
09:20 – 09:35	45	***Pharmacokinetics of 5-Aminolaevulinic Acid Induced Protoporphyrin IX in Patients with Basal Cell Cancer*** E Filonenko, T Karmakova, A Feofanov, V Sokolov, R Yakubovskaya, Y Andreeva, G Frank, E Lukyanets, G Vorozhtsov *Hertsen Moscow Oncologic Inst., Moscow, Russia*	54	***Light Interaction with Human Central Nervous System Progenitor Cells*** J J Anders and I Ilev *USUHS, Bethesda,USA*	59	***Light Dosimetry in Collagen Phantoms in the Presence of Melanin and Methylene Blue*** E M Sales, N A Daghastanli, M S Baptista, R Itri *University of São Paulo, São Paulo, Brazil*
09:40 – 09:55	46	***Intravitreal Bevacizumab (Avastin) in Combination with Photosens Photodynamic Therapy for Choroidal Neovascularization*** S Avetisov, M Budzinskaya, G Stolyarenko, I Schegoleva, I Gurova, E Kazarian, S Kuzmin, G Vorozhtsov *SUE "ISCC "Intermedbiophyschem", Moscow, Russia*	55	***Performance Evaluation of Quantum Cascaded Lasers through VisSim Modeling*** I I Mahamoud, M B El-Mashade, M S El-Tokhy *Al Azhar University, Cairo, Egypt*	60	***Thermal Effects from Low Level Laser Therapy (LLLT) on the Human Skin*** J Joensen, J H Demmink, J M Bjordal *Bergen University College, Norway*
10:00 – 10:15	47	***Effect of Photodynamic Therapy on a Lung Cancer Cell Line (A549)*** S L Manoto, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	56	***Microfluidics as a Tool for Micro-manipulation*** S Potgieter *CSIR, Pretoria, South Africa*	61	***LILT in Cardiopulmonary Bypass Surgery - How to Determinate the Optical Properties and Light Distribution in Blood?*** A C Magalhães, A L O Ramos, M C Chavantes, E M Yoshimura *Universidade de São Paulo, São Paulo, Brazil*
10:20 – 10:35			57	***The Effect of Low Level Laser Irradiation on Adult Human Adipose Derived Stem Cells*** B Mvula, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*		
10:40	**MORNING TEA** (Jacaranda and Acacia Room) **POSTER VIEWING**					

Tuesday 21 October 2008

	SESSION B4 (Baobab Room) Photodynamic Therapy *Chair: T Nyokong* *Co-Chair: D Hawkins Evans*		SESSION B5 (Tshukudu Room) Basic Science and Mechanisms of Phototherapy *Chair: R Steiner* *Co-Chair: U Oron*		SESSION B6 (Tlou Room) Light-Tissue Interaction and Tissue Optical Properties *Chair: A W Parker* *Co-Chair: K Moore*	
11:15 – 11:30	48	***Cancer Cell Death Induction Mechanisms by Second Generation Photosensitizers*** H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	16	***New Introspections into Laser Interactions with Living Cells*** *L Ailioaie, M Sanduloviciu, D A Chiran, C Ailioaie* *Laser Clinic, Iassy, Romania*	62	***Native Fluorescence Spectroscopy of Oral Normal Mucosa: Preliminary Study in Humans*** R C Fiorotti, E Nicola *FCM, UNICAMP, Campinas, São Paulo, Brazil*
11:35 – 11:50	49	***The Changes of Tumor Volume and Weight after PDT: An Animal Study*** X Y Zhang, F A H Al-Watban, B L Andres *King Faisal Specialist Hospital and Research Centre, Riyadh, Kingdom of Saudi Arabia*	17	***Laser Therapy Applications on Microcrystalline Arthropathies. Laboratory and Clinical Results at the End of 10 Years of Experience*** *F Soriano, V Campana* *Instituto Argentino de Medicina Laser, Rosario, Argentina*	63	***The Effect of Low Level Laser Irradiation on Dog Sperm Motility Is Dependent on Power Laser Application*** M I Corral-Bagués, M M Rivera, T Rigau, J Erodríguez-Gil, J Rigau *Rovira i Virgili University, Reus, Catalonia, Spain*
11:55 – 12:10	50	***Examination of Novel Diode Irradiation Sources for Experimental Photodynamic Therapy*** R Yakubovskaya, A Pankratov, N Morozova, N Kazachkina, V Mizin, G Pleshkov, V Chissov, G Vorozhtsov *Moscow Hertsen Research Institute of Oncology, Moscow, Russia*	18	***Effect of Low-Level Laser Irradiation on Odontoblast-like Cells*** *C F Oliveira, J Hebling, P P C Souza, N T Sacono, F R Lessa, R F Z Lizarelli, C A S Costa* *University of São Paulo, São Paulo, Brazil*	64	***Sun is Life*** M Rogers *Medicinal Therapeutic LASERS Rx, Stirling, Australia*
12:15 – 1230	51	***The In Vitro Effects of Laser Irradiation on Human Breast Carcinoma and Immortalised Human Mammary Epithelial Cell Lines*** K Powell, E-L Laakso, P Low, S Ralph *Griffith University, Gold Coast, Queensland, Australia*	19	***The History of WALT and its Contribution to the Science and Clinical Practice of Photomedicine*** *K Moore* *Medical Director, Dr Kershaw's Hospice, Oldham UK*	65	***Effect of Low– Level Laser Therapy on Skin Fibroblasts of Streptozotocin–Diabetic Rats*** M Bayat, M Mirzaei Shahid Beheshti University, Tehran, Iran
12:35 – 12:50	52	***The Efficacy of Photodynamic Therapy on Human Metastatic Melanoma Cells*** C A Robertson, D Hawkins Evans, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	20	***The Different Response of the Main Symptoms of Inner Ear Exhaustion to a Specific High Dosage Low Level Laser Therapy*** L Wilden *Private Office for Low Level Lasertherapie, Bad Füssing, Germany*		
13:00	**LUNCH**				**(Sun City Pool Deck/Calabash Restaurant)**	

Tuesday 21 October 2008

	SESSION B7 (Thutlwa Room) Dermatology, Immunology and Urology *Chair:* *Co-Chair: M Copeland*		SESSION B8 (Tshukudu Room) Molecular Imaging and Optical Coherence Tomography *Chair: G Keiser* *Co-Chair: A W Parker*		SESSION B9 (Tlou Room) Pain Management *Chair: P O Fryda* *Co-Chair: J Vandeputte*
14:05 – 14:20	66	***Laser Application in Tracheo Bronchial Tumors*** B Krishna Rau *Deemed University Hospital, Chennai, India*	73	***Experiences and the Use of OCT in Urology*** R Sroka, M Puels, K Weick , M Bader, U Mueller-Lisse, P Weidlich, H Stepp *Laser-Research Laboratory, University Munich, Germany*	77	***A Systematic Review of the Literature of the Effects of Laser Irradiation on Peripheral Mammalian Nerves: Relevance to the Pain Relieving Effects of Low-Level Laser Therapy*** R Chow , L Laakso , P J Armati, G D Baxter *The University of Sydney, Sydney, Australia*
14:25 – 14:40	67	***Role of LLLT in Peyronie Syndrome Treatment*** J Rigau *Tarragona, Spain*	74	***Optical Coherence Tomography (OCT) Evaluating Low Intensity Laser Effects on Wound Healing*** S C Núñez, A Z de Freitas, A S Garcez, D Meneguzzo, M P Raele, N D Vieira Jr, M S Ribeiro *CETAO-SP, São Paulo, Brazil*	78	***The Prospect for Interstitial Use of Low and High Intensity Lasers Rather Than Conventional Surface Application*** P Bradley *Nova Southeastern University, Fort Lauderdale USA*
14:45 – 15:00	68	***Light and Immunity*** K A Samoilova, N A Zhevago *Institute of Cytology, Russian Academy of Sciences, St. Petersburg, Russia*	75	***Non-Linear Microscopy and its Applications for the Study of the Structure and Dynamics of Biological Systems*** R W Sparrow , N Prent, R Cisek, C Greenhalgh, N Rohitlall, M-S Milkereit, C Green, V Barzda *CSIR Biosciences, Pretoria, South Africa*	79	***The Importance of the Doctor-Patient Relationship in Pain Management*** G Ross *DDS, Tottenham, Canada*
15:05 – 15:20	69	***How the Effects of Phototherapy on the Neuroendocrine Immune System Modulate Wound Healing*** M Dyson *King's College London (KCL), University of London, UK*	76	***Effectiveness of Thermoluminescent Crystals for Diagnostic Radiology Dose at 70 to 120 kvp*** *S A Rahimi* *Mazandaran University of Medical Sciences, Sari, Iran*	80	***Dose Thresholds and Effect Mechanisms for Pain Management with Laser*** E-L Laakso *Griffith University, Gold Coast, Queensland, Australia*
15:25	**AFTERNOON TEA**					**(Jacaranda and Acacia Room)**
16:00 – 16:15	70	***Effective Therapy of Low Level Laser in 810 nm Wavelength on Severe Acne*** Y H Hou, Y-Q Hou, X Fang *Guangzhou TCM Hospital, Guangzhou, Taiwan*			81	***Intravenous Laser Blood Irradiation in the Management of Juvenile Idiopathic Arthritis*** C Ailioaie, L Ailioaie, D A Chiran *"Gr. T. Popa" University of Medicine, Iassy, Romania*
16:20 – 16:35	71	***Treatment of an Extensive Infantile Hemangioma with a Combination of Nd-YAG Laser and Intense Pulsed Light (IPL) System*** F Yourdkhani *Milad General hospital, Tehran, Iran*			82	***The Effect of Low Level Laser Therapy (LLLT) by the Patients with Acute Low Back Pain after Acute Ischemic Stroke*** L Nikcevic, M Savic, N Zaric, A Plavsic *The Hospital for Prevention and Treatment of Cerebrovascular Diseases "Saint Sava", Beograd, Serbia*
16:40 – 16:55	72	***Effects of Low Level Laser Therapy on Acute Infectious Process Pseudomonas aeruginosa-Induced in Mice*** A J da Silva Santos, D T Meneguzzo, R A Prates, M S Ribeiro *IPEN-CNEN/SP, São Paulo, Brazil*			83	***Intravenous Laser Blood Irradiation in Progressive Muscular Dystrophy in Children*** D A Chiran, L Ailioaie, C Ailioaie *"Al. I. Cuza" University, Iasi, Romania*
18:30 for 19:00	**GALA DINNER**					**(Baobab Room)**

Wednesday 22 October 2008

08:00	**REGISTRATION**					
08:15 – 08:55	3	**SESSION C** (Baobab Room) ***From Online Diagnosis To Therapy*** R Steiner *University of Ulm, Ulm, Germany* *Chair: C Enwemeka* — *Co-Chair: S Rochkind*				
		SESSION C1 (Baobab Room) **Physiotherapy, Rheumatology and Laser Accupuncture** *Chair: M Dyson* — *Co-Chair: R Chow*		**SESSION C2** (Tlou Room) **Cardiology, Internal Medicine and Neurology** *Chair: S Rochkind* — *Co-Chair: J J Anders*		**SESSION C3** (Tshukudu Room) **Laser Safety, Dosimetry, Standards, Education & Management** *Chair: I Tolic-Norrelykke* — *Co-Chair:*
09:00 – 09:15	84	***Low Level Laser Therapy in Lateral Elbow Tendinopathy. A Systematic Review and Meta-analysis with Procedural Assessments*** J M Bjordal, J Joensen, M I Johnson, R A B Lopes-Martins, E Ljunggren *Bergen University College, Bergen, Norway*	94	***Low-energy Laser Irradiation of Stem Cells for Cardiac Repair Following Myocardial Infarction*** H Tuby, L Maltz, U Oron *Tel Aviv University, Tel Aviv, Israel*	103	***Metrology In Laser Therapy*** J H Nicola, G Borghi, H P H Grieneisen, I B Couceiro, E M D Nicola *INMETRO, Duque de Caxias, Brazil*
09:20 – 09:35	85	***Effect of 655 nm Low Level Laser Therapy (LLLT) in Exercise-Induced Skeletal Muscle Fatigue in Humans*** E C Pinto Leal Junior, R A B Lopes-Martins, F Dalan, M Ferrari, F M Sbabo, R A Generosi, B M Baroni, V V Iversen, J M Bjordal *University of Caxias do Sul (UCS), Caxias do Sul, RS – Brazil*	95	***Application of Low-level laser Therapy after Coronary Artery Bypass Grafting (CABG) Surgery*** N Kazemi-kho, K Babazadeh, M Lajevardi, Y Jahangiri Noudeh *Milad General Hospital, Tehran, Iran*	104	***Laser in Medicine: High-tech Requiring High Quality*** P O Fryda *Chief Executive Officer (CEO), Prague, Czech Republic*
09:40 – 09:55	86	***The Effect of Low Level Laser Therapy (infra-red, 810 nm) on Collagenase-induced Rat Achilles Tendinitis: COX-1 and COX-2 Expression and Prostaglandin E2 Production*** R L Marcos, J M Bjordal, R C Pallota, L Ramos, S Penna, S Teixeira, M N Muscará, R A DosSantos, M H Catelli de Carvalho, L Frigo, J Joensen, V V Iversen, R A B Lopes-Martins *University of São Paulo, São Paulo, Brazil*	96	***The Effect of Low Level Laser Irradiation of Adipose Derived Stem Cells and their Differentiation into Smooth Muscle Cells*** T Mathope, H Abrahamse *University of Johannesburg, Doornfontein, South Africa*	105	***Improving Low Intensity Laser Therapy with Monte Carlo Simulation*** A L O Ramos, A C Magalhães, R Y Sohara, M C Chavantes, E M Yoshimura *Universidade de São Paulo, São Paulo, Brazil*
10:00 – 10:15	87	***Effects of Low-level light Therapy in Treatment of Overuse Sports Injuries in Professional Athletes – Descriptive Pilot Study*** D A Ramagole *University of Pretoria, Pretoria, South Africa*			106	***Effect of Different Skin Types on the Required Dose for Photodynamic Therapy*** A E Karsten, J S Dam *CSIR, Pretoria, South Africa*
10:20	**MORNING TEA** (Jacaranda and Acacia Room)					

Wednesday 22 October 2008

	SESSION C4 (Baobab Room) Physiotherapy, Rheumatology and Laser Accupuncture *Chair: JM Bjordal* *Co-Chair: B Krishna Rau*		SESSION C5 (Tlou Room) Cardiology, Internal Medicine and Neurology *Chair: U Oron* *Co-Chair:*		SESSION C6 (Tshukudu Room) Plastic Surgery, Otolaryngology and Orthopedics *Chair: K A Samoilova* *Co-Chair: A Pinheiro*	
10:55 – 11:10	88	***Low Level Laser Therapy in Inflammatory Disorders: Effects and Possible Mechanisms of Action*** R Lopes-Martins *Institute of Biomedical Sciences, University of São Paulo, São Paulo, Brazil*	97	***Laser Phototherapy in the Treatment of Cancer*** L Hode *Swedish Laser -Medical Society, Sweden*	107	***Laser Liposculpture for Body Recontouring*** M Copeland *Mount Sinai School of Medicine, USA*
11:15 – 11:30	89	***Analgesic Effect of Acupuncture Combined with Low-power Laser Acupointing on Arthroalgia and Neuroalgia of Elderly Patients with Chronic Problems*** X Fang, Y-H Hou *Guangzhou TCM Hospital, Guangzhou, P R Chna*	98	***Preliminary Study on the Muscle Activity Below the Injury in Complete Paraplegia and Quadriplegia Treated by Laserponcture® and Monitored by Electromyoscan*** A Bohbot *La Chapelle Montlinard, France*	108	***Increasing Desirability of Scars by Low Power Lasers*** G Majlesi *Private office, Isfahan, Iran*
11:35 – 11:50	90	***Clinical Effects of Low Level Laser Therapy in Treatment of Subacute Low Back Pain in Relation with Applied Dose*** L Konstantinovic, D Bascarevic, Z Kanjuh *Medical school Clinic for Rehabilitation, Belgrade, Serbia*	99	***Comparison between the Effect of Low Level Laser Therapy and Injection of Botox in Treatment of Anal Fissure (Clinical Trial, Case Control)*** T Nikou Khorsand, S Mokmeli, L Daneshvar, N Soror, H Hosseini *Milad Hospital, Tehran, Iran*	109	***Full Laser Implant Surgery*** I Ingenegeren *Private practice GMP Ingenegeren-Ewert, Bottrop, Germany*
11:55 – 12:10	91	***Low Level Infra-Red Laser Therapy (810 nm) in Experimental Skeletal Muscle Strain: Functional and Biochemical Evaluation*** L Ramos, S Penna, RL Marcos, R Pallota, S Teixeira, MN Muscará, R Dos Santos, MHC de Carvalho, L Frigo, VV Iversen, JM Bjordal, RAB Lopes-Martins *Inst. of Biomedical Sciences, Univ. of São Paulo, São Paulo, Brazil*	100	***Intestinal Hypersensitivity to Low Level Laser Therapy (LLLT) (Case Report)*** Z Vatankhah, S Mokmeli, B Ghahgharaie Zamani *Milad Hospital, Tehran, Iran*		
12:15 – 12:30	92	***The Effect of Low Level Laser Therapy (810 nm) in Carrageenan-induced Knee Osteoarthritis in Rats*** R C Pallota, J M Bjordal, L Ramos, S Penna, R L Marcos, S Teixeira, M N. Muscará, R Dos Santos, M H Catelli de Carvalho, L Frigo, J Joensen, V V. Iversen, R A B Lopes-Martins *Inst.of Biomedical Sciences, Univ. of São Paulo, São Paulo, Brazil*	101	***Mitochondrial Responses of Normal and Injured Human Skin Fibroblasts Following Low Level Laser Irradiation*** I L Zungu , D H Hawkins Evans , H Abrahamse *University of Johannesburg, Doornfontein, South Africa*		
12:35 – 12:50	93	***Lasertherapy Applied in an Experimental Model of Myopathy*** N Servetto, D Cremonezzi, J Simes, F Soriano, M Moya, V Campana *Instituto Argentino de Medicina Láser, Rosario, Argentina*	102	***Intravascular Laser therapy (IVL) in pre-hypertension and Hypertension Conditions*** S Mokmeli, Sh Bishe, Kh Kahe, M Shakhes *Milad Hospital, Tehran, Iran*		
13:00	**CLOSING OF CONFERENCE AND LUNCH**				**(Sun City Pool Deck/Calabash Restaurant**	

PLENARY PRESENTATIONS

ABSTRACTS

SESSION A

01
RECENT ADVANCES ON THE USE OF LASER PHOTOBIOMODULATION ON BONE

A L B Pinheiro

Laser Center, School of Dentistry, Federal University of Bahia, 62, Araujo Pinho Ave, Canela, Salvador, BA, 40110-150, Brazil. E-mail: albp@ufba.br

This presentation aims to report the state of the art on the photoengineering of bone repair using Laser photobiomodulation - LPBM. Laser photobiomodulation has been reported as an important tool to positively stimulate bone both in vivo and in vitro. These results indicates that photo-physical and photochemical properties of some wavelengths are primary responsible for the tissue responses. The use of correct and appropriate parameters has been shown to be effective on the promotion of a positive biomodulative effect on the healing bone. A series of papers reporting the effects of LPBM on bone cells and tissue are presented and new and promising protocols developed by our group are presented. The results of our studies and others indicates that bone irradiated mostly with IR wavelengths shows increased osteoblastic proliferation, collagen deposition and bone neorformation when compared to non irradiated bone. The results of our studies indicate that the effect of LPBM is more effective is the treatment is carried out at early stages when high cellular proliferation occurs. Vascular responses to LPBM were also suggested as one of the possible mechanism responsible for the positive clinical results observed following LPBM. It still remains uncertain if bone stimulation by laser light is a general effect or if the isolate stimulation of osteoblasts is possible. It is possible that the LPBM effect on bone regeneration depends not only on the total dose of irradiation, but also on the irradiation time and the irradiation mode. The threshold parameter energy density and intensity are biologically independent of one another. This independence accounts for the success and the failure of LPBM achieved at low-energy density levels.

SESSION B

02
LASER PHOTOTHERAPY: A NEW MODALITY FOR NERVE CELL TISSUE ENGINEERING TECHNOLOGY, CELL THERAPY AND NERVE REPAIR

S Rochkind

Division of Peripheral Nerve Reconstruction, Department of Neurosurgery, Tel Aviv Sourasky Medical Center, Tel Aviv University, Israel. E-mail: rochkind@zahav.net.il

Background: Laser phototherapy and nerve cell tissue engineering technology were applied as a supportive factor for accelerating and enhancing axonal growth and regeneration after injury or reconstructive peripheral nerve or spinal cord procedures.
Methods: I- This experimental study summarize our experience with (a) laser phototherapy for treatment of peripheral nerve injury (crush and neurorraphy); (b) composite peripheral nerve or spinal cord transplants for treatment of peripheral nerve or spinal cord injury after complete transection and reconstruction.
II- A clinical double-blind, placebo-controlled randomized study was performed to measure the effectiveness of laser phototherapy on patients who had been suffering from incomplete peripheral nerve injuries for 6 months up to several years.
III- Laser treatment was investigated on the growth of nerve cell cultures.
Results:
I – *Peripheral nerve studies* show that laser phototherapy increases growth of myelinated axons in the injured nerve and after composite implant reconstruction.

Spinal Cord studies shows appearance of electrophysiological signals and axonal growth after spinal cord reconstruction by composite implant.

II- *A clinical double-blind, placebo-controlled randomized study* shows that in long-term peripheral nerve injured patients low power laser irradiation can progressively improve peripheral nerve function, which leads to significant functional recovery.

III - *Cell Therapy:* 780 nm laser irradiation accelerated migration and fiber sprouting of neuronal cells.

Conclusions:

- The animal and clinical studies on the promoting action of phototherapy on peripheral nerve regeneration make it possible to suggest that the time for broader clinical trials has come.

- 780 nm laser treatment of nerve cell cultures stimulated migration and fiber sprouting of neuronal cells and, therefore, can be considered as potential therapy for neuronal injury.

SESSION C
03
FROM ONLINE DIAGNOSIS TO THERAPY

R Steiner

Institute for Laser Technologies in Medicine and Metrology at the University of Ulm, Helmholtzstr. 12, D-89081 Ulm, Germany; rudolf.steiner@ilm.uni-ulm.de

Two examples will demonstrate the usefulness of online diagnosis for laser therapy.

For may years caries diagnosis by optical imaging and laser excited fluorescence has been tried in dentistry. But the breakthrough has been achieved when using red light and detecting the caries NIR fluorescence. Combining such detection method online with the Er:YAG laser for caries and infected plaque removal, an automatic laser system has been created which can be successfully applied not only to remove caries but also in periodontics and endodontia.

The second approach deals with wound healing and the débridement of chronic wounds. Here, laser speckle imaging and speckle contrast is used to define areas where the laser has to be activated for the dèbridement of such ulcera with the Er:YAG laser until healthy tissue appears. Desinfection and less painful treatment without narcosis are additional advantages of this automatic procedure. Combining online diagnosis and laser therapy make laser systems working in cases when dentists do not see the site of operation and on the other hand could be beneficial for physicians and patients as well.

ORAL PRESENTATIONS

ABSTRACTS

BASIC SCIENCE & MECHANISMS OF PHOTOTHERAPY

SESSION A1

04
EFFECT OF LASER IRRADIATION ON MITOCHONDRIAL RESPONSES OF STRESSED KERATINOCYTES

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The mechanism of low level laser therapy at the cellular level is based on the increase of oxidative metabolism of mitochondria, which is caused by electronic excitation of components of the respiratory chain. Lasers improve the flow of electrons through the respiratory chain and increase the mitochondrial production of ATP without increasing the production of free radicals. Cell stress results in mitochondrial inhibition which reduces ATP energy output and increases free radical production to accelerate common signs of normal ageing. This study aimed to investigate the mitochondrial responses of keratinocytes exposed to sub-cytotoxic stresses following laser irradiation.

Human keratinocyte cell cultures were modified to induce changes in mitochondrial membrane potential[1]. Control conditions included normal keratinocytes and cells treated with (i) p-(tri-fluoromethoxy) phenyl-hydrazone or FCCP as an uncoupler of oxidative phosphorylation, (ii) 2-deoxy-D-glucose (2-DOG) to inhibit glucose transport and deplete cells of ATP and (iii) oligomycin an F_0-ATP synthase inhibitor to disrupt mitochondrial membrane potential. Three experimental conditions were established to induce sub-cytotoxic stress namely; (i) keratinocytes grown in media without the antioxidant, bovine pituitary extract[2], (ii) UVC irradiation which photochemically induces DNA lesions and (iii) tBHP (tert-hydroperoxide) which chemically induces oxidative stress.

Modified control cells (FCCP, 2-DOG and oligomycin) did not show a positive effect of laser therapy since the respiratory chain was inhibited and consequently no additional ATP was produced to increase the rate of DNA synthesis. Experimental cells irradiated with 1.5 J/cm^2 using a 648 nm diode laser (30 mW) showed an increase in ATP cell viability, decrease in cytotoxicity and increase in cell proliferation 96 h post irradiation. Laser irradiation accelerated the mitochondrial responses of experimental cells as shown by changes in intracellular Ca^{2+}, cytochrome c, NADH and mitochondrial membrane potential[3]. The results confirm that an increase in intracellular Ca^{2+} stimulates the mitochondrial respiratory chain to bring about an increase in ATP production, which ultimately results in photobiomodulation to restore homeostasis of stressed cells.

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05

COMPARATIVE STUDY OF THE EFFECTS OF THE USE OF THE CO_2 LASER AND CHLORHEXIDINE ON THE HEALING OF CUTANEOUS WOUNDS INFECTED BY STAPHYLOCOCCUS *AUREUS*

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The aim of this study was to compare histological and microbiologically the efficacy of the use of the $C0_2$ Laser and Chlorhexidine Gluconate (0.5%, 2% and 4%) on cutaneuos wounds infected by Staphylococcus aureus. Wound infection constitutes a risk for the patients and it is usually associated to increased morbidity, mortality and hospital costs. It is accepted that local treatment of these infections is effective. Standardised wounds created on the dorsum of Wistar rats were infected with *Staphylococcus aureus* and treated as follows: Group 1: control; Group 2: Chlorhexidine Gluconate (0.5%), 1 min, 6 days; Group 3: Chlorhexidine Gluconate (2%), 1 min, six days; Group 4: Chlorhexidine Gluconate (4%), 1 min, 6 days; Group 5: CO_2 Laser, CW, RSP, 8W, 10s, single application, maintaining surface debris; Group 6: CO_2 Laser, CW, RSP, 8W, 10s, single application, removing surface debris, and Group 7: CO_2 Laser, CW, RSP, 8W, 10s, single application, removing surface debris and immediate sacrifice. Eight days after wounding material from the surface of the wound was collected for microbiology and the animals were sacrificed and specimens taken for light microscopy. Microbiological examinations showed that on group 2 the bacteria were not found on 50% of the animals. On group 3.83% were germ-free, on group 4 complete elimination; group 5 50% and on group 6 66.6%. On group 7 no bacteria were found. Histological examination showed a better result for CO_2 laser treated wounds compared to the others. It is concluded that the use o a 4% Chlorhexidine solution was more effective on decontaminating the wounds. However, wounds treated with the CO_2 laser and with the removal of surface debris healed better.

06

LOW-INTENSITY LIGHT THERAPY: EXPLORING THE ROLE OF REDOX MECHANISMS

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Although the underlying mechanisms have not yet been clearly elucidated, LILT-induced mitochondrial photostimulation has been shown to increase ATP production and cause transient increases in reactive oxygen species (ROS). In some cells, this process appears to participate in reduction/oxidation (redox) signalling, involved in cellular redox homeostasis, antioxidant mechanisms, proliferative control, and pathogen defense. In plants, photostimulation of the analogous photosynthetic electron transport chain also leads to redox signaling and has been demonstrated to be integral to cellular function. Light-stimulated production of ROS in plants is associated with cellular proliferation, anti-oxidation, and pathogen defense. In gene therapy research, ultraviolet lasers are being used to photostimulate cells through a process which also appears to involve redox signaling. It seems that visible and near visible low-intensity light can be used to modulate cellular physiology in some nonphotosynthetic cells, acting through existing redox mechanisms, which are to some degree analogous to related mechanisms in plants. In this manner, LILT acts to promote proliferation, anti-oxidation, pathogen defense and cellular homeostasis. Understanding the role of redox state and signaling in LILT may

be useful in guiding future therapies, particularly in those conditions associated with pro-oxidant conditions. Pro-oxidant conditions demonstrate an increased sensitivity to LILT, presumably through oxidation of cythochrome C oxidase. Advances in biophoton detection, associated with the generation of ROS from the mitochondrial electron transport chain, may prove helpful in understanding the relationship between mitochondrial photosensitivity and cellular redox state.

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07
NEAR INFRARED LASER THERAPY (810NM) ON LYMPH NODES: EFFECTS ON ACUTE INFLAMMATORY PROCESS

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The aim of the present work was to investigate the effects of infrared (810nm) low level laser therapy (LLLT) on the acute inflammatory process by the irradiation of lymph nodes, using the classical model of carrageenan-induced rat paw edema.
Thirty male Swiss mice were randomly divided into five groups. The inflammatory induction was performed in all groups by a sub-plantar injection of carrageenan (1mg/paw). The paw volume was measured before and 1,2,3,4 and 6 hours after the injection using a plethysmometer. Myeloperoxidase (MPO) activity was analyzed as a specific marker of neutrophil accumulation at the inflammatory site. The control group didn't receive any treatment (**GC**); **GD** group received sodium diclofenac (1mg/kg) 30 minutes before the carrageenan injection; **GP** group received laser irradiation directly on the paw (1 Joule, 100mW, 10 sec) 1 and 2 hours after the carrageenan injection; **GLY** group received laser irradiation (1 Joule, 100mW, 10 sec) on the inguinal lymph nodes; **GP+LY** group received laser irradiation on both paw and lymph nodes 1 and 2 hours after the carrageenan injection.
MPO activity was similar in sodium diclofenac as well as in GP and GLY groups and significantly lower than GC and GP + LY groups. Paw edema was significantly inhibited in GP and GD groups when compared to the other groups. Interestingly the GP+LY presented the biggest edema, even bigger than the control group.
LLLT showed an anti-inflammatory effect when the irradiation was performed on the site of lesion or at the correlated lymph nodes but showed a pro-inflammatory effect when both paw and lymph nodes were irradiated during the acute inflammatory process.
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SESSION A4

08
EFFECT OF LASER IRRADIATION ON DIABETIC WOUNDED FIBROBLAST CELLS IN VITRO

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Collagen is a major component of the extracellular matrix (ECM) and supports most tissues. Collagen degradation and synthesis is an important step during wound healing and is produced by fibroblasts. There are several sequential steps leading to the completion of collagen synthesis. Matrix metalloproteinases (MMPs) are proteolytic enzymes responsible for collagen degradation, and are inhibited by tissue inhibitor metalloproteinase (TIMPs). Nitric oxide (NO), released during wound healing, has shown to have an effect on collagen synthesis. Diabetes is known to be associated with impaired wound healing, and is associated with a variety of alterations in connective tissue metabolism. Loss of collagen related to diabetes may be due to decreased levels of synthesis or enhanced metabolism of newly synthesized collagen or both. The non-healing diabetic foot wound displays elevated MMP activity[1] and a reduction in NO[2]. There is a direct relationship between NO levels and MMP expression, such that low NO concentrations result in high MMP levels[3]. Laser irradiation has been shown to have an effect on all these proteins (MMP, TIMP, and collagen), as well as on NO.

This study aims to determine if low level laser irradiation stimulates collagen synthesis through regulation of MMP-1 and TIMP-1 and -2 through the NO mediated pathway in diabetic induced wounded human skin fibroblast cells. This study also aims to determine effects on cellular proliferation.

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09
SIGNALLING NETWORKS AND LASER THERAPY – WHICH ONES ARE IMPORTANT?

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As early as the 1970s studies regarding the biostimulating properties of laser therapy (LT) were being conducted. It has since been found that low power laser irradiation using red and near infrared wavelengths can reduce inflammation and stimulate tissue regeneration[1]. Today LT is being used by numerous professionals, including: dentists; physiotherapists; dermatologists and rheumatologist.

Although a body of clinical and scientific evidence has accumulated over the last few years the majority of the available literature with regard to the beneficial effects of LT is anecdotal in nature. Furthermore, there is a lack of understanding as to the mechanisms by witch LT achieves its bio-stimulating effects, leaving this area of scientific study out on the fringe of the so-called “serious science”.

However, researchers are now beginning to focus on the biochemical aspects of LT. With the increasing interest in the modes of action of LT, we have started to investigate the effects of low level LT on the activation of several pro-survival and pro-apoptotic signaling pathways in murine myoblast C2C12 cells. Using a 635nm laser, we have established a dose of energy that is capable of inducing an increase in proliferation (measured using the MTT technique), transiently increasing the phosphorylation of p38 MAPK and providing a

sustained elevation in the levels of phosphorylated AKT. In addition we see increased levels of cleaved caspase-3.
Further work is required to fully elucidate the signaling networks involved in the responses seen to LT, and to link these biochemical changes to the putative site of action of the laser irradiation, namely the mitochondria.
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10
OPTICAL FIBERS FOR LASER MEDICINE: A REVIEW

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Recently there has been an extensive and rapidly growing use of photonics technology for biomedical diagnosis, therapy, and imaging, and for basic life sciences research. The wavelengths range from about 190 nm in the ultraviolet to around 10 μm in the near infrared. The light levels of interest can be as low as a few nanowatts for spectroscopic applications and as high as several watts during light therapy sessions.
Major challenges in biophotonic applications to the life sciences include how to collect and transmit emitted light to a photon detector, how to deliver a wide range of optical power levels to a tissue area or section during different categories of therapeutic healthcare sessions, and how to access a diagnostic or treatment area within a living being with an optical probe or a radiant energy source in the least invasive manner. Depending on the application, all three of these factors may need to be addressed at the same time.
The unique physical and light-transmission properties of optical fibers enable them to resolve such implementation issues. Consequently, various types of optical fibers are finding widespread use in biophotonic instrumentation for life sciences related clinical and research applications. The basic fiber structures which can be used in biomedical applications include conventional solid-core fibers, specialty solid-core fibers, conventional hollow-core fibers, and photonic crystal fibers. Each of these structures has certain advantages and limitations for specific uses in different spectral bands. This paper describes several categories of fiber structures and materials that are appropriate for use at different wavelengths, discusses the performance characteristics needed for specific spectral bands, and shows some typical biomedical applications.

11
THE EFFECT OF LASER IRRADIATION ON ADIPOSE DERIVED STEM CELLS IN THE EXPRESSION OF B-INTEGRIN AND THY-1

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Adipose tissue is derived from the mesenchyme and contains an easily isolated supportive stroma. This is an active and dynamic tissue that is composed of a number of different cell types. Adipose derived stem cells (ADSC) have a remarkable differentiation potential *in vitro*, and may differentiate into fat, neuron, cartilage, heart, bone and smooth muscle when treated with specific induction media[1-3]. Laser irradiation has been shown to increase protein expression, viability and migration of stem cells *in vitro*[2,4].
The aim of this study is to determine the effect of laser irradiation on ADSC after 24, 48 and 72 h on the expression of Thy-1 (CD 90) and β_1-Integrin (CD 29) using a diode laser with a wavelength of 636 nm at 5 J/cm^2, as well as viability and proliferation of the cells after these specific time intervals. The presence of the cell specific proteins will be investigated using immunofluorescence, and increases or decreases in the proteins using SDS-PAGE and Western Blot. Viability of the cells will be assessed using adenosine triphosphate (ATP) and Trypan Blue tests, and proliferation with the WST-1 test.

Since laser irradiation has been shown to increase protein expression in ADSC, it is thought the similar results will be initially observed in this experiment, however, as shown by Mvula *et al*., (2007)[2], expression of β_1-Integrin was greater 24 h post irradiation as compared to 48 h post irradiation. Therefore the effect of the time intervals may show varying results and will give an indication on whether laser irradiation maintains stem cell character over longer periods, or whether the cells revert to adipose tissue or perhaps differentiate into another cell type.

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SESSION A7

12
THE ABSORPTION BEHAVIOUR OF OXYGEN AND THE MITOCHONDRIAL ENERGY TRANSFER – THE IMPORTANCE OF ELECTROMAGNETIC RADIATION (LIGHT)

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Background and Objective: On the basis of well known biochemical models, a consistent theoretical model of the mitochondrial energy transfer is described by taking into consideration the radiation phenomena of electrons (wave-particle dualism).
Regarding the absorption behaviour of the respiratory chain and of oxygen, the importance of electromagnetic radiation (molecular bond energy of pyruvat, natural solar light and therapeutical low level laserlight) for the mitochondrial energy transfer becomes evident.
Results and Conclusion: the process of the mitochondrial energy transfer is identified as a process of radiation during the oxidation process of foodstuffs and finally again during the reduction of oxygen to water. In the mitochondrion electromagnetic molecular bond energy of the hydrogen and covalent bonds of pyruvat is released as a radiation and is absorbt from oxygen, NAD/NADH and the so called electron carriers of the respiratory chain.
Respecting the absorption behaviour of oxygen 391,2 nm until 844,6 nm it becomes evident, that the role of oxygen during the energytransfer processes from pyruvat to the respiratory chain (electron transfer to oxygen) is just as a radiation and absorption process of electromagnetic waves (light).

13
EFFECT OF LOW LEVEL LASER IRRADIATION ON PRO-INFLAMMATORY CYTOKINE EXPRESSION IN FIBROBLASTS EXPOSED TO VARIOUS INSULTS

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Cytokines are small regulatory peptides (glycoproteins) produced and secreted in the body by nucleated cells and they serve to participate in repair and defence processes. They bind to specific receptors on target cells and follow required cellular signal transduction. There are multiple cytokines and growth factors involved in wound healing and inflammatory processes and they include Vascular Endothelial Growth Factor (VEGF), Platelet Derived Growth Factor (PDGF), Fibroblast Growth Factor (FGF), Transforming Growth Factor (TGF), Interleukin (IL)-1, IL-6 and Tumour Necrosis Factor alpha (TNF-α). Phototherapy has been used for many years and it is known to stimulate mitochondrial activity, cell proliferation and for wound healing acceleration. However, the effect of phototherapy on cytokine modulation has not been explored extensively especially under various stress mechanisms.
This study aimed at evaluating the effects of laser irradiation on the expression of pro-inflammatory cytokines involved in impaired wound healing processes in conditions such as a diabetic wound. Diabetic wound environment can proceed to be hypoxic and/or acidic for abnormally prolonged period.
A normal skin fibroblast cell line (WS1) was used *in vitro*. The cells were exposed to different insults, namely: normal wounded, diabetic wounded or hypoxic environment and normal cells served as controls. Experimental cells were exposed to a fluence of 5 J/cm^2 irradiation using 636 nm diode laser and controls were not irradiated. The effects of laser irradiation on cytokine expression were examined 1 and 24 h post-irradiation. The Trypan Blue test was used for cell viability, XTT for cell proliferation, Caspase 3/7 for apoptosis and ELISA for cytokine expression.

Irradiated fibroblasts exhibited an increased cell proliferation and viability post-irradiation with increased improvement after 24 h. IL-1 and TNF-α levels were nearly diminished in experimental cells, but the results were environment and time dependent, whereas IL-6 levels in irradiated samples were elevated in a time dependent manner as well. Phototherapy resulted in accelerated wound closure and reduced inflammation in a time and environment dependent fashion.

14
SPERM MOTILITY ENHANCEMENT WITH LOW LEVEL LASER AND LED PHOTOBIOMODULATION. A DOSE RESPONSE STUDY.

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Introduction
The purpose of this study was to investigate the effects of Low Level Laser Therapy and LED Photobiomodulation (LLLT) on human spermatozoa motility in-vitro. The effects of LLLT on cellular function arise predominantly from stimulation of ATP production and are dose dependent. Dose is a function of beam intensity and irradiation time.
Material and Methods
Three separate human semen specimens were subjected to LLLT from two continuous output sources at various irradiation times using a THOR Photomedicine system: 104 LED cluster of 660nm and 850 nm (45mW/cm2), and a 200mW laser 810nm GaAlAs single laser (90mW/cm2). Sperm motility of test and control aliquots was assessed using the sperm motility index (SMI) and the total functional sperm count (TFSC) parameters measured with a SQA IIB analyser.
Results
The SMI and TFSC increased up to four fold compared to controls but with inhibitory effects observed at higher doses (longer exposure times). The maximum effect varied with the light intensity and irradiation time.
Conclusion
The results demonstrate that human spermatozoal motility is modified by exposure to light and that this modification is dependent on beam intensity and exposure time. Wavelength and coherence may also play a role.

15
DNA DAMAGE AND EFFECTS OF PHOTOTHERAPY ON METHLYPURINE DNA GLYCOSYLASE

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Phototherapy has been found to be beneficial in a wide variety of therapeutic applications, it has been shown that laser therapy can induce DNA damage; however this damage appears to be repairable. It has been shown that irradiation at 628 nm upregulates DNA repair genes. This study aimed to determine the effects of phototherapy induced DNA damage and activation of the DNA repair gene methylpurine DNA glycosylase (MPG).
Wounded (W) human skin fibroblast cells (WS1) were irradiated on day 1 and 4 with 5 or 16 J/cm^2 using a Helium-Neon (He-Ne) laser (632.8 nm) and cellular responses assessed 1 or 24 h post irradiation on day 4. DNA damage was assessed using the Comet assay, with and without formamidopyrimidine glycosylase (Fpg), while real time reverse transcriptase polymerase chain reaction (RT-PCR) assessed gene expression of MPG.

At both 1 and 24 h, W cells irradiated with 5 J/cm^2 showed complete wound closure, a significant increase in viability and no significant DNA damage, with or without Fpg. However, cells irradiated with 16 J/cm^2 showed incomplete wound closure, a significant decrease in viability and significant increase in DNA damage compared to W cells irradiated with 5 J/cm^2. Real time RT-PCR showed that the reference gene, β-actin, was not influenced by laser irradiation and was used to normalise the expression of MPG. MPG was not detected in cells irradiated with 5 or 16 J/cm^2.
Irradiation with 16 J/cm^2 is not beneficial to wounded WS1 cells, and induces more DNA damage than 5 J/cm^2. High doses of irradiation cause more damage than low doses. MPG has a low copy number of genes and does not remain elevated for long and hence could not be detected 8 h post irradiation on day 4.

SESSION B5

16
NEW INTROSPECTIONS INTO LASER INTERACTIONS WITH LIVING CELLS

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The elucidation of the mechanism through which laser irradiation selectively affects the function of the cells located in different parts of a living organism is essential for improving the efficiency of this modern medical practice. Treatments performed in clinical laboratories have proved the beneficial effects of laser therapy, promoting the retrieval of functions, the relief of pain and the limitation of the complications in different pathologies.
The aim of the present paper is to offer a new model and understanding of the laser interactions with living cells.
Starting from the experimentally proved fact that self-organization is grounded on direct conversion of thermal energy into electric field energy by a mechanism that involves emission of photons, we explain the machinery by which living systems emit biophotons. Involving internal collective effects of quantum processes, it results that external physical agents like laser irradiation, but also other ones, potentially affect the machinery by which the cell nucleus, and implicitly the cell as a whole, lives. By coherent emission of biophotons and their ability to absorb such signals at resonance, the cells exchange information, thus controlling the health conditions of an organism.
By laser irradiation it is possible to improve the electrical charging process of the nucleus that, in its turn, can enhance the stability of the genetic functions of the cell as a whole. Consequently, the specific resistance of the cell and implicitly its immune reactions increase.

17
LASER THERAPY APPLICATIONS ON MICROCRYSTALLINE ARTHROPATHIES. LABORATORY AND CLINICAL RESULTS AT THE END OF 10 YEARS OF EXPERIENCE

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Microcrystalline arthropathies ((hydroxyapatite, calcium pyrophosphate, and urates), are prevalent among geriatric patients, who are more vulnerable to the side effects of drugs. The effectiveness of laser therapy for pain relief, free of side effects, has been reported in many painfully conditions The aim of this presentation is a review of our experience in the use of laser therapy in crystal deposition arthritis from experimental irradiation

in rats and clinical applications in humans. Two milligrams of each of the above-mentioned crystals was injected in both joints of the back limbs in three groups of rats; these groups were then treated with laser irradiation. Three other groups received no treatment after the injections. We determined the plasmatic levels of inflammatory markers :fibrinogen, prostaglandin E2, and Tumoral Necrosis Factor (TNF). Tissues (prostaglandin E(2)) and conducted anatomopathological studies. Also the anti-inflammatory effect of the Helium-Neon (He-Ne) laser compared with non-steroidal anti-inflammatory drugs (NSAID): diclofenac, meloxicam,celecoxib and rofecoxib was studied in acute and chronic arthritis produced by hydroxyapatite and calcium pyrophosphate in rats. Fibrinogen, L-citrulline, nitric oxide and nitrotyrosine were determined. Patients with acute gout arthritis were randomized into two groups and treated over 5 days: group A, diclofenac 75 mg orally, twice a day; and group B, laser irradiation once a day. Patients with knee chronic pyrophosphate arthropathy were randomized into two groups and treated over 21 days; group A, diclofenac 50 mg orally, twice a day; and group B, laser irradiation once a day. Patients with shoulder chronic hydroxyapatite arthropathy were randomized into two groups and treated over 21 days; group A, diclofenac 50 mg orally, twice a day; and group B, laser irradiation once a day. Results: Fibrinogen, prostaglandin E(2), and TNF concentrations in the rats injected with crystals and treated with laser decreased significantly as compared with the groups injected with crystals without treatment. The inflammatory and oxidative stress markers were positively modified by photostimulation Both laser therapy and diclofenac achieved rapid pain relief in patients with acute gouty arthritis without significant differences in efficacy. Laser therapy was more effective than diclofenac in patients with chronic pyrophosphate arthropathy and in patients with chronic apatite deposition disease. Conclusion: Laser therapy represents an effective treatment in the therapeutic arsenal of microcrystalline arthropaties. Supported by the findings of our experiments in rats, the possibility of employing a combination therapy with low doses of NSAIDs and laser irradiation arises as a new and exciting challenger for future studies.

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EFFECT OF LOW-LEVEL LASER IRRADIATION ON ODONTOBLAST-LIKE CELLS

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Low-level laser therapy (LLLT), also referred to as therapeutic laser, has been recommended for a wide array of clinical procedures, among which the treatment of dentinal hypersensitivity. *In vivo* studies in which teeth were treated with LLLT have demonstrated an increase in dentin matrix synthesis and lower intensity of pulp inflammatory reaction. However, the mechanism that guides this process remains unknown. Therefore, the objective of this study was to evaluate *in vitro* the effects of LLL irradiation on cell metabolism (MTT assay), alkaline phosphatase (ALP) expression and total protein synthesis. The expression of genes that encode for collagen type-1 (Col-1) and fibronectin (FN) was analyzed by RT-PCR. For such purposes, odontoblast-like cell line (MDPC-23) was previously cultured in Petri dishes (15,000 cells/cm^2) and submitted to stress conditions during 12 h. Thereafter, 6 applications with a monochromatic near infrared radiation (GaAlAs) set at predetermined parameters were performed at 12-h intervals. Non-irradiated cells served as a control group. Neither the MTT values nor the total protein levels of the irradiated group differed significantly from those of the control group (Mann-Whitney test; $p>0.05$). On the other hand, the irradiated cells showed a decrease in ALP activity (Mann-Whitney test; $p<0.05$). RT-PCR results demonstrated a trend to a specific reduction in gene expression after cell irradiation, though not significant statistically (Mann-Whitney test; $p>0.05$). It may be concluded that, under the tested conditions, the LLLT parameters used in the present study did not influence cell metabolism, but reduced slightly the expression of some specific proteins.

19
THE HISTORY OF WALT AND ITS CONTRIBUTION TO THE SCIENCE AND CLINICAL PRACTICE OF PHOTOMEDICINE

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The World Association for Laser Therapy (WALT) was formed in 1994 in Barcelona, Spain at the joint Congress of the International Laser Therapy Association (ILTA) and the International Society for Laser Application in Medicine (ISLAM) when these two international groups merged and WALT became the leading world body for promoting research, education and clinical applications in the field of laser photo-stimulation. The events leading up to this amalgamation are reviewed and the subsequent history of WALT is recounted.
The journal "Laser Therapy", founded in 1989, and initially published by John Wiley, UK provided the first peer reviewed journal dedicated to the science, research and clinical practice of laser photo-medicine. "Laser Therapy" helped to dispel the confusion over the nomenclature of the subject and promoted proper research protocols. The WALT journal was published subsequently in Japan (1995-1998) and in the USA (2000-2003) before being officially transferred to the USA publishers Mary Ann Liebert, Inc. under the title "Photomedicine and Laser Surgery".
WALT hosts a World Congress every 2 years. Past Congresses are reviewed demonstrating a commitment to raising awareness of good scientific practice and reproducible clinical regimes and protocols and encouraging education and student participation. WALT's Scientific Secretariat continues to stress the accurate reporting of data and its critical assessment. Despite a turbulent history WALT remains the leading society for the promotion of photomedicine.

20
THE DIFFERENT RESPONS OF THE MAIN SYMPTOMS OF INNER EAR EXHAUSTION TO A SPECIFIC HIGH DOSAGE LOW LEVEL LASERTHERAPY

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Object of examination: An evaluation of the course and the results of inner ear therapy of 5000 patients regarding the main symptoms of inner ear exhaustions loss of hearing, hyperacusis, dysacusis, pressure in the ear, tinnitus, otogenetic vertigo/Morbus Menière.
Material and method: A statistical analysis of pre- and post therapeutical audiometry controls, a clinical balance test, a regular questionnaire.
Results: An average significant improvement of the hearing capacity over all frequencies, a more significant improvement in the deep frequencies (0,125 kHz – 0,75 kHz) and in the high frequencies (6 kHz – 12 kHz) can be documented as well as a significant improvement of dysbalance and of the symptoms hyperacusis, dysacusis, pressure in the ear, tinnitus, otogenetic vertigo and Morbus Menière.
The different time structures of the improvements will be presented. Out of this different time patterns it is possible to lead the patients successful through the inner ear regeneration process.
It is possible to establish a biologically plausible correlation of the hearing improvement with the patients age and the duration of the inner ear exhaustion.
The highest correlation, however, was with the total amount of the transferred energy. A new set up in October 2008 will be presented.

DENTISTRY

SESSION A2

21
LLLT IN DENTISTRY - SCIENTIFIC BACKGROUND AND CLINICAL CASE PRESENTATION

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Lasertherapy is based on non-thermal mechanisms of light upon biological tissues. The magnitude of the effects depends on the cells physiological status before irradiation. Scientific evidence helped us formulate clinical protocols that have proved to be safe and effective for over 20 years. LLLT has been used in the treatment of alveolitis, aphtha, gingivitis, herpes simplex, idiopathic facial palsy, implantodontics, odontalgia, paresthesia, temporomandibular disfunction (TMD) and dentinal hypersitivity. A 5-year clinical study evaluated the efficiency of lasertherapy in the treatment of dentinal hypersensitivity using diode laser 780nm CW, 40mW, 4 J/cm2 /tooth, and it was effective in 91.27% of the cases. Studies to evaluate histologically the reaction of dentinal pulp in rats after application of LLLT proved it was efficient in the stimulation of odontoblast cells, producing reparative dentin and closing dentin tubuli. Another study evaluated effectiveness of two types of lasers - 660nm red, and 830nm infrared - acting as dentine desensitizers, as well immediate and late therapeutic effects. Prevention and treatment of oral mucositis resulting from radio and chemotherapy will also be highlighted. Several clinical cases, including doses and application mode will be presented to demonstrate the efficiency of lasertherapy in clinical dentistry.

22
NATIVE FLUORESCENCE OF ORAL CAVITY: EARLY DIAGNOSIS AND TREATMENT

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Native Fluorescence, also known as autofluorescence or natural fluorescence of biological tissues can be observed under excitation by ultraviolet (UV), near visible or even visible light.
In human tissues such as the oral mucosa, this fluorescence can be seen and also documented under UV excitation due to the presence of photoactive substances such as proteins, amino acids, collagen, elastin and other endogenos substances such as protopoyphyrin IX (PpIX).
Healthy oral mucosa presents a Native Fluorescence band in the region of 450 to 500 nm of the electro-magnetic spectrum, although some spectral deviations, due to the presence of biofilm or dental plaque, can be identified through the appearance of a peak around 634nm, characteristic of the protoporphyrin IX (PpIX) presence. The presence of PpIX is due to bacterial deposition mainly *porphiromonas gengivalis* (*P.gengivalis*) and other periodontogenic microorganisms such as, *P. intermedia, A. actinomyces and Prevotella sp.*
In particular, the oral mucosa is easily exposed to traumatisms and, also very sensitive to the consequences of habits such as smoking and alcoholism, which rise its risk for dysplasias and neoplasias. So, early detection and/or treatment of pre-malignant lesions are very important to achieve cure or reduce its morbidity.
Native Fluorescence spectroscopy is being considered an important and reliable method for early detection of tissue alterations and is being used as a diagnostic procedure to distinguish dysplasias, neoplasias and also some inflammatory diseases of the oral cavity by comparing normal with pathological tissue. The inflammatory diseases of the oral mucosa are usually associated with the presence of those porphyrin producers bacteria, so large deposits of PpIX can be found at these lesions and can adequately respond to light therapy mediated by a 630nm light source, which means that they can be treated by photodynamic therapy (PDT) mediated either by Laser or LED light.

23
PAIN INVESTIGATIONS FOR DENTAL PROCEDURES USING CONVENTIONAL AND LASER MODALITIES

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Dental procedures are generally associated with pain and discomfort when using mechanical instrumentation. The purpose of this presentation is to investigate the possible advantages and mechanisms involved in the laser treatment of common dental procedures in relation to pain and discomfort. These will involve both hard and soft tissues using high power for ablation procedures and low power for therapeutic purposes. There are several possible mechanisms of action to explain the effects of laser therapy. In the case of temporomandibular joint (TMJ) pains, one possible mechanism is the photo-activation of inactive enzymes present in painful muscle tissue. Using low level laser, it is possible to reactivate enzymes such as superoxide dismutase (SOD) may be responsible for the breakdown of free radicals contributory to tissue damage and cell dysfunction, a possible cause of pain in dysfunctional muscle tissue[1]. An increase production of cellular ATP in dysfunctional muscle tissue as a cellular response to the laser energy may contribute to improved cell function in dysfunctional muscle tissues responsible for painful trigger point formation[2]. Another possible mechanism of action of the laser energy is the enhancement of increased local blood flow to assist with healing of any damaged tissue cells[3]. For hard tissue procedures such as cavity preparation in dentin tooth structure, pain sensation is commonly associated with mechanical instrumentation by high-speed drills. The pain sensation is strongly related to the positive and negative change in pressure to the dentinal tubule fluids[4]. Using a laser for dentin ablation may reduce the amount of dentinal tubule fluid movement by using a localized vaporization process that will generate localized pressures that will not affect the pain receptors. This presentation's focus is to provide an overview of the experimental work and related clinical cases done to evaluate laser effects on pain management during operative/surgical dental procedures.

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24
LASERS AND THE DENTIST

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The purpose of this presentation is to demonstrate the use of laser therapy within a general dental practice setting. Soft tissue lasers are widely used in dental practice primarily for excision of excess and diseased soft tissues as the laser surgery can be more precise and clean. Dentists are always looking for ways to improve the quality of care that they provide to the patients and to offer a wider range of services.

To this intent a diode laser 810nm was converted to deliver a therapeutic dosage through a diffuser hand piece. Clinical cases will show how this modality is used in the practice covering a wide range of conditions commonly seen in clinical dental practice. These will include TMJ dysfunction, herpetic lesions, ulcers, angular chelitis and others.

All the cases treated responded favourably to treatment and was highly rated by the patients. Pain management and healing were the two main facts that were examined. Pain was scored using the VAS and the healing assessed by clinical examination. As the laser is also used for ablation it will also be shown that the accelerated healing and lack of complications is most likely due to the therapeutic effect of the laser on the underlying tissues.

SESSION A5

25
PHOTOTHERAPY IN DENTISTRY: CLINICAL APPLICATIONS AND CASE STUDIES

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There has been a large amount of research done regarding the effects of light on the cell, which results in many applications within a number of healthcare fields, including physiotherapy, chiropractic treatments, veterinary medicine and dentistry. The following effects of laser light are examples of can benefit a dental practice and the clinical treatments:

-Increased lymphatic flow → reduction in edema
-Stimulation of β-endorphins→ pain relief
-Stimulation of Collagen synthesis in fibroblasts→ important in wound healing
-Stimulation of Osteoblasts and Odontoblasts→ important for production of bone and dentin
-Accelerated immune response (histamine, bradykinins, Substance P, acetylcholine, etc.), → decreased edema and post-op pain.

It is the above effects that allow a dental practitioner to utilize low level laser therapy in their practice for many of the clinical treatment they do on a daily basis, including the following:

-Reduction of pain and faster healing following root canals
-Diagnosis of a painful tooth where traditional methods have not been successful
-Reduced pain and swelling after extractions and surgery leading to a reduced need for prescription medications
-Treatment of dentine hypersensitivity
-Treatment of dry socket
-Faster healing of soft tissue lesions (cold sores, apthous ulcers and denture sores)
-Treatment of children's teeth without the use of needles
-Nerve Regeneration
-Treatment of facial pain and TMJ conditions

These enhanced clinical applications result in increased patient satisfaction and comfort, improved clinical treatments and financial return. The aim of this presentation is to outline the clinical applications of low level lasers in dentistry, with emphasis on specific case studies supporting each application where the laser helped to achieve an outcome that could not be achieved by traditional methods.

26
EFFECTS OF CONTINUOUS AND PULSED INFRARED LASER APPLICATION ON BONE REPAIR USING DIFFERENT ENERGY DOSES. STUDY IN RATS.

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The Laser Therapy effects on the cellular proliferation are extensively searched and widely known. However, there are controversies on the best out put power used in the applications, the ideal fluency and irradiance, better emission mode and the adequate number of sessions in order to obtain the best results. An incorrect use of Laser Therapy may provoke inhibitory effects however a small number of papers in the literature has proved this effect. The aim of this paper was to search for the best application fluency and emission mode, using an infrared laser in the repair of bone defects in the rat tibia. Thus, the histological quality of the neo-formed bone was evaluated by analysis using common optic microscopy and polarized light.

Application Parameters: 100 mW, 830 nm, laser beam diameter = 0,06 nm, CW and 10 Hz, 3 sessions with 72 h of interval, energies and respective fluencies: 2J =70 J/cm^2 , 4J =140 J/cm^2, 6J =210 J/cm^2, 8J =160 J/cm^2, 10 =200 J/cm^2.
Conclusions: Laser Therapy has increased and accelerated the time bone repairing process (in the initial period of 10 days).
This laser effect showed to be dose-dependent with the presence of an effective therapeutic window presenting biostimulation of the bone tissue between 4J and 8 J of total energy for both emission modes.
The use of the laser with 10 J of energy generated, characterized by the bio-inhibition of the tissues (in the initial period of 10 days). This inhibition took place at the exact irradiation spot).

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DIODE LASER 660NM IN THE PREVENTION AND TREATMENT OF ORAL MUCOSITIS

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Objective: The objective of this multidisciplinary study was to evaluate prospectively, quantitatively e qualitatively the effect of Diode laser 660nm , P=30mW, E=2J per point in the prevention and treatment of OM in human patients suffering from head and neck cancer submitted to radio(Rt) and/or chemotherapy(Ch).
Methods: This study was carried out by a multidisciplinary team of Cancer Hospital of Mato-Grosso,(Brazil). A total of 84 patients, divided into 2 groups: - group (L): 43 patients with laser, - group (C) 41 patients without laser. Area of irradiated tissue was considered as 1cm²/application point, in a contact mode. Irradiated regions were: 3 points in the jugal mucosa, 3 points in the internal mucosa of inferior lip, 3 points on soft palate, 2 points on palatine folds, 2 points on sublingual caruncles and 5 points on the tongue. Applications were twice weekly, before or after radiotherapy sessions.
Results: Statistically significant differences were observed between the two studied groups (NCI scale) Patients in group (L) did not usually present OM ($p<0,0001$). However, all patients in group (C) presented OM levels I to III. Patients in the group (C) presented growing indexes of pain since the 1st week of Rt treatment. Patients in group (L) reported absence of pain during the whole radiotherapy treatment. VAS scale, analysis of variance (ANOVA), with significance level of 5%.
Conclusion: LLLT was effective in preventing and treating severe oral effects induced by radio and chemotherapy, controlling inflammation, maintaining mucosal integrity, bringing more comfort to patients, thus improving their quality of life.

SESSION A8

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EVIDENCE BASED LASER PERIODONTICS

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One of the greatest advances in dentistry has been the laser, which was developed back in 1958, but it has been in the last few years when the laser has changed the concept of the dental practise.

The laser can be used as a completely new technique in which the laser is used for the entire procedure, or it can also be used as a complement of the conventional technique, so that the professional doesn´t have to change anything in the conventional procedure.
In many fields of the medicine the laser is being used successfully and dentistry is one of them. The laser can be used in soft tissues, hard tissues (enamel, dentin and bone), and biostimulation among other things, but unfortunately we still don´t have a unique laser for everything.

In periodontics, there are so many uses such us gingivectomy, gingivoplasty, periodontal flaps , root amputation, pocket elimination, frenectomy, bacterial reduction, wound healing after conventional flap surgery and many more but…, why should I use a laser? , what kind of laser should I buy? Is it really necessary? Does it really do what they say? Is it better than the conventional technique? Are there any prove of it?
All of those questions and many more will be answered in the Evidenced based laser periodontics lecture by showing bibliographic back up and clinical cases to support it so that you believe on it the way I do.

29
PHOTODYNAMIC THERAPY ASSOCIATED WITH CONVENTIONAL ENDODONTIC TREATMENT IN PATIENTS WITH ANTIBIOTIC RESISTANT MICROFLORA

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This study present the antimicrobial effect of photodynamic therapy (PDT) combined to endodontic treatment with conventional endodontic treatment alone in patients with necrotic pulp and presenting a microflora resistant to a previous antibiotic therapy.
Seven patients with periapical lesion whom have been treated with conventional endodontic treatment associated with antibiotic therapy were selected. All the patients had at least a microorganism resistant to antibiotic medication. Microbiological samples were taken after accessing the root canal, after conventional manual endodontic therapy and after photodynamic therapy. The photodynamic therapy used methylene blue as a photosensitizer and a 660nm diode laser as a light source. All the root canals were filled with a calcium hydroxide paste for 1 week and had been obtured in the followed session. Radiographs were taken after obturation and following 6 months. Endodontic therapy alone, even producing a significant reduction on microorganisms do not eliminate them from the root canal; while the combination with PDT had a total microflora reduction. Radiographic follow up showed considerable reduction in the lesion area after 6 months. Results suggest that the use of PDT added to conventional endodontic treatment leads to a further major reduction of microbial load. PDT is an efficient treatment to kill microorganisms resistant to chemical antimicrobial agents and antibiotic therapy. It is a non-cumulative local treatment, which may be an appropriate approach for the treatment of infections in the oral cavity.

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COMPARISON OF THE TEMPERATURE CHANGES IN SUBPERIOSTAL BONE AND THE RISK FOR BONE DAMAGE DURING FRENECTOMIES WITH ELECTROTOM AND ER:YAG LASER

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The aim of this study is to investigate the temperature changes in subperiostal bone and the risk for bone damage during frenectomies with Electrotom and Er:YAG laser.
Thirty parts of sheep lower jaws with the fraenulum preserved were used in the study. Electrodes from thermocouples were inserted in the subperiostal bone tissue in three places, coronal, middle, apical with a vertical distance to each other of 5mm. A water bath with 37 degrees Celsius was used to stabilize the start temperature in 36.8-37.2 degrees. The sheep jaw were stabilized in gypsum inside the water bath with the fraenulum part be extended out of the water. The sheep jaws were divided in three groups with 10 parts in every group. In these jaw parts frenectomies were performed using electrotom and Er:YAG LASER with 700μs pulses, 150mj, 20Hz, with water spray 5ml/min. and without water spray. The results of temperature changes, the maximum temperature, the irradiation time, the cooling time and the time of the temperature staying above the 47 degrees Celsius were registered and statistically analyzed.
The results of the temperature changes have shown that the electrotom is creating a much higher temperature elevation in subperiostal tissues (up to 80.3ºC) than the Er:YAG laser without the water spray (up to 40.3ºC) while the use of the water spray (5ml/min..) in Er:YAG laser creates a maximum temperature drop down to 34.1 degrees Celsius.
As conclusion we can say that in frenectomies with Er:YAG laser, there are much less thermal changes to the subperiostal bone tissues than with electrotom and therefore the risk of thermal damage with Er:YAG in subperiostal bone tissue compare to the electrotom is minimal.

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BENEFITS OF THE USE OF THE CO_2 LASER IN ORTHODONTICS

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Esthetics is an important factor for patients seeking the orthodontic treatment and not always the orthodontist is able to make adjustments on the gingival contour and this aspect is neglected. Many orthodontists are familiar with the name laser. However, there is a lack of information regarding their application on the orthodontic practice. There are several options for the use of CO_2 lasers on surgical procedures of interest to orthodontists, especially on soft-tissues. There is no evidence that the use of the CO_2 laser has any side-effect or contra-indication on surgical procedures. This paper reports a series of surgical procedures carried out on orthodontic patients. It is concluded that the Carbon dioxide laser not only allow surgeons to enhance current surgical options for treatment, but also have contributed to the evolution of a variety of new procedures that are now commonplace in Oral surgery and its use shows several benefits for the orthodontic patient.

WOUND HEALING

SESSION A3

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THE SIGNIFICANCE OF TREATMENT PARAMETERS USING VARIOUS PHOTON SOURCES IN NORMAL AND DIABETIC WOUND & BURN HEALING

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For 25 years of consistent research in Low Power Laser Therapy (LPLT) numerous findings were established. In- vitro studies using malignant and normal cell cultures and in-vivo using Normal and Diabetic Sprague-Dawley rat wound/burn animal healing models, we found that laser photobiomodulation depends on laser wavelengths, dose and treatment schedule but not on dose rates and laser skin transmissions. At wavelengths ranging from 442- 10600nm (using HeCd 442nm, Argon 488-514nm, HeNe 632.8nm, Krypton 670nm, GaAlAs 780 & 830nm, CO2 10600nm and Diode Lasers (532nm, 633nm, 670nm 785nm, 819nm and 980nm), the optimum stimulatory effect on wound and burn healing was mostly at 633nm while the least was at 10600nm. The laser dose applied was also critical. Depending on the dose, the effect of stimulation, zero-bioactivation or inhibition was observed in vivo and in-vitro. When compared with the effect of Light Emitting Diode Therapy (LEDT, 510-879nm), LPLT was best in enhancing wound healing in rats. Laser on Burns caused minimal stimulatory effects; nonetheless, better cosmesis was palpable when laser-treated-rats had less discernible scars. Laser Therapy seemed to work best in wound and burn healing on diabetic rats and tantamount to the speed of healing on non-diabetic (untreated control) rats.
These findings indicate that LPLT with the appropriate treatment parameters enhances healing by rapidly restoring the function and aesthetic appearance of the injured skin. Thus, this modality may be an invaluable preference for treating patients suffering from disfiguring cutaneous healing disorder such as burns and diabetes. The optimum dose we established for each laser wavelength may also be extended for use in LPLT for acute and chronic pain.

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LOW INTENSITY LASER THERAPY APPLICATION IN WOUND HEALING

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The management of wounds continues to challenge all medical disciplines involved in the process. Utilization of conventional methods is frequently unsuccessful, resulting in subsequent amputation. The need for more effective therapeutic solutions is therefore paramount. Low Intensity Laser Therapy (LILT) is clinically effective for an extensive number of pathologies. Photon irradiation within a specific therapeutic window initiates a variety of positive physiological responses.
Objective: To determine the outcomes of the LILT Wound Healing Program, for patients presenting with pain, compromised neurological and physiological function and tissue damage associated with vascular/ diabetic ulcerations.
Methodology: A retrospective case review of clinical features including pain, measured by visual analogue scale (VAS), motor function, measured by range of motion (ROM), and visual outcome, measured by wound area for six patients (n=6; 5 males, 1 female; $\bar{x}$ age = 67.83).

Results: All patients in the study had chronic ulcers of their lower extremities, persisting in excess of 3 months prior to being subjected to the LILT Wound Healing Program. Significant progress with regard to alleviation of pain ($\bar{x}$ ΔVAS = -5), improvements in motor function ($\bar{x}$ ΔROM = +40%), progressive epithelialization ($\bar{x}$ wound closure rate = 3% / week) and 100% complete wound closure was achieved. No recurrence of pathology at least one month post cessation of therapy was evident ($\bar{x}$ % reduction in wound area = 100%).
Conclusions: The LILT wound healing approach achieves consistent, effective and clear endpoints. The program is cost effective, creates no adverse effects and leads to salvage of extremities.

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COMPARATIVE STUDY OF LASER AND LED SYSTEMS OF LOW INTENSITY APPLIED TO TENDON HEALING

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Laser is one of the most effective resources of treatment for tendinous injury when anti-inflammatory and cicatrizing effects are wanted. However, it is considered an expensive treatment and so, an alternative and cheaper light therapy as effective as it has been searched and the light emitting diodes, LEDs, are a promising candidate for it. Results from the studies already done have been useful to predict the possible effects of LED on the injured tissues, but are not enough to establish a treatment protocol that guarantees its safe recommendation as a substitute therapeutic tool for tendon repair. The aim of this study was to compare de effects of laser and LED of low intensity on the treatment of lesioned Achilles tendon. The experimental model consisted of a partial mechanical lesion of the right Achilles tendon of 46 rats, which were divided in 5 groups, 4 with 10 animals and one, the control group, with 6. One hour after the lesion, the injured animals received the respective applications of laser (685nm / 830nm, 6J/cm^2) or LED (630nm / 880nm, 6J/cm^2), and the same procedure was repeated each 24h, for ten days. The healing process and the deposition of collagen fibers were evaluated through polarization microscopy. The data showed that significant differences between laser and LED treatments were not observed on fifth or tenth day of therapy (P> 0,05), making possible the establishment of a safe and effective protocol for tendon healing by the use of LED light. Phototherapies based on LEDs have proved to be effective on tendon healing, presenting results similar to low-intensity laser therapy (LILT). A better collagen fibers alignment and organization with dose of 6J/cm^2 were achieved through applications of laser 830nm and LED 880nm.

35
EFFECTS OF NIR-LED LIGHT THERAPY ON WOUND HEALING

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Clinical experiences with LED NIR treatment in chronic wounds: In mid-2006 a group of South African engineers made a portable LED NIR light therapy device* that was lightweight, easy to operate (pre-programmed treatment protocol buttons) and relatively inexpensive. Once the CE registration was completed we started to test the device in a general hospital and in a community nursing setting in Belgium, The Netherlands and the UK.
The wounds in the general hospital were mainly venous ulcers that failed to heal with classic wound dressings. In the community nursing setting we treated, apart from venous ulcers, several irradiation burns, diabetic foot ulcers and small burn wounds.

The treatment time per wound is dependent on the size of the wound, but it takes about 2 minutes to treat an area of 4 cm² when a small (100mW) probe is used and when a large probe (400mW) is used over 60 cm² can be treated, also in 2 minutes. The wounds need to be dressed and usually we do continue with the treatment that was started before the NIR light therapy.

So it is not always clear that the light therapy is the only reason why the wounds start to heal, but if the wound dressing (or therapy) is not getting a satisfactory result and the wound starts to heal when NIR light therapy is started then it is clear that the latter is playing an important role in the stage from chronic towards acute healing. In some patients we did not see a significant change in the healing of the wound with the NIR light therapy, but when the patient was suffering from pain before, they do report that the NIR light therapy is acting like a painkiller. We do not know why some chronic wounds do not respond to NIR light therapy, but we do know that NIR light therapy is used as a pain treatment by physiotherapists.
Results: We treated 12 chronic wounds in a *hospital setting* and in 10 patients we found a significant change in healing rate. In short, the chronic wounds turned into acute healing wounds and healed within days while the 2 other wounds slowly healed, but within months. The small time needed for the light therapy in conjunction with the common wound therapy and the simple operation instructions was very well received. The portability of the device was not really an issue in the hospital settings since power plugs are available.
In the *community nursing* setting we treated 16 chronic venous ulcer wounds and here the experiences were similar to the hospital setting. Thirteen wounds healed within weeks, while the remaining 3 were not really responsive to the NIR light therapy. The portability of the device was a very important factor and as most community nurses have short time frames per patient (in Belgium), the short treatment time was necessary.
Four burn wounds (second degree) were treated with NIR light therapy and the main reason for the usage of the NIR light therapy was the pain killing effect the patients were experiencing in this acute wounds. In general the nurses liked the device very much, but they were not used to this kind of wound therapy. Some nurses talked about a “Star Trek” like experience where a simple portable device is healing the wounds.
Conclusion: NIR light therapy is relatively new for a wound care setting, but the doctors and nurses quickly learned how to work with the device and were very surprised with the results they found. The short treatment time and the user friendliness were very important and the pain killing effect + the acute healing effect in most of the wounds were key factors in the reports of the test users.
* SanoSkin® Photizo® light therapy device

SESSION A6

36
LED PHOTOTHERAPY PROMOTES TISSUE REPAIR IN CHRONIC DIABETIC AND VENOUS ULCERS

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Background: Diabetic and venous ulcers are difficult to treat even with biomedically advanced treatment options. We used a double-blind completely randomized clinical trial to determine the effect of phototherapy on chronic diabetic and venous leg ulcers that were not responding to other available treatments.
Methods: Fourteen patients with 20 diabetic ulcers and 20 patients with 32 venous ulcers were treated either with Probe One (placebo treatment) or Probe Two (real treatment) for a maximum of 12 weeks or until their ulcers healed fully. A third normal control group with venous ulcer did not receive placebo or real phototherapy. Each ulcer was cleaned with physiological saline, dressed with sulfadiazine and then covered with gauze and bandage as appropriate. Placebo or real phototherapy was administered twice per week to the appropriate groups, using a Dynatronics Solaris™ device with a cluster of 660 and 890nm light, 5.0 cm^2 probe and 500 mW average power. Each spot size was treated for 30 seconds (fluence equals 3.0 J/cm^2) and treatment was administered until the entire ulcer surface was covered. Healing of each ulcer was digitally photographed and quantified with Image J® software.
Results: In each study, ulcers treated with probe two healed significantly faster than placebo or control ulcers ($P < .05$). Similarly, the rate of tissue granulation was higher in patients treated with probe two. Treatment with probe two also resulted in pain relief in patients with diabetic ulcer.
Conclusion: These findings indicate that combined 660nm and 890 nm light promotes healing of diabetic and venous ulcers that failed to respond to other forms of treatment.

37
COMPARISON OF 633NM DIODE LASER THERAPY, REGRANEX AND SOLCOSERYL IN DIABETIC BURN HEALING: BIOCHEMICAL AND BIOMECHANICAL ANALYSIS OF SCAR

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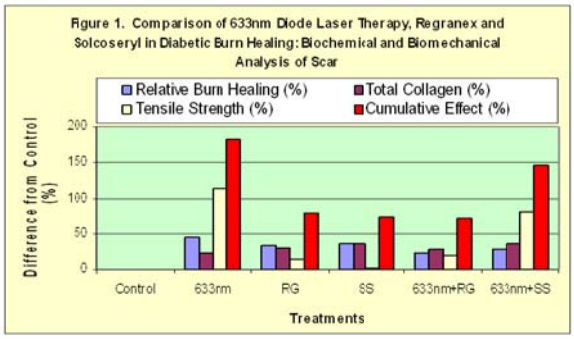
Laser therapy for Burn Healing acceleration is slowly gaining recognition as an effective clinical tool. This study determined and compared the efficacy of 633nm Diode Laser, Regranex™ (RG), Solcoseryl™ (SS) and treatment combinations of 633nm laser *plus* RG or SS in burn healing of diabetic male Sprague-Dawley rats (N=32). Diabetes was induced using 70mg/kg streptozotocin. Burn was inflicted using a metal rod heated up to 600 ºC that was stamped for two seconds on the shaved flank of the rats. Laser treatment of $5J/cm^2$ was applied three-times/week. RG and SS were used according to manufacturers' recommendation. Relative Burn Healing (RBH%) acceleration was significantly influenced ($p \leq 0.05$) by 633nm laser (44.4%) > SS (35.4%) > RG (33.5%) > 633+SS (28.7%) > 633+RG (23.7%). Significant increase in Total Collagen was effected by all treatments ($p \leq 0.05$): SS (36.86%) > 633nm+SS (36.76%) > RG (31.37%) > 633nm+RG (29.01%) > 633nm (23.32%). While Tensile Strength were: 633nm (114.4 %) > 633nm+SS (80.3 %) > 633nm+RG (19.4 %)> RG (13.8 %)> SS (1.2 %). The Cumulative Effect (%) of the experimental treatments summarizes the quality of Burn Healing in terms of

healing speed, collagen quantity and strength of the scar. Our data showed that 633nm laser alone or in combination with SS gave the best outcome (See figure 1). Further studies showing collagen ultrastructure and quantitative analysis of its subtypes would shed light on the diverse pattern of our results.



38

EFFECT OF BLUE LIGHT INTRAVENOUS LASER ON BLOOD SUGAR IN DIABETIC TYPE 2 PATIENTS

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Introduction: The intravascular irradiation of low power laser has been applied in pre-clinic and clinic to treat various pathological processes. However, the mechanism is not fully understood so far. Recent studies have showed that blue and red light irradiation in vitro and in vivo can increase production of nitric oxide (NO), superoxide anion, and related reactive oxygen species (ROS). It is proposed that some of the therapeutic effects of light are due to the changes in the metabolism of L-arginine. The regulation of L-arginine turn over by the use of light at blue wavelengths between 400 nm and 510 nm can be the explanation for some of the observed effects of blue light; lowering of blood pressure, pain killing effect, regulating insulin production, anti-inflammatory action, and possible effects on the release and homing of stem cells.
Materials and methods: Ten Iranian diabetic type 2 patients received 7-12 sessions intravenous blue light laser. We used 450nm, 2.5mW intravenous laser. Serum blood sugar (BS) was measured before and after treatment.
Results: Mean BS level before treatment was 333.8mg/dl±70.02 and mean BS level after treatment was 210.54±63.78. Serum blood sugar decreased significantly after intravenous blue light laser therapy (p value: 0.001).
Discussion: It is concluded that intravenous blue light laser together with traditional therapeutic methods maybe beneficial in patients suffering from diabetes type 2.

39

INVESTIGATING THE VARIATION IN OPTICAL PARAMETERS OF LOW LEVEL LASERS IN DIABETIC BLOOD SAMPLES COMPARED WITH THE NORMAL SAMPLES

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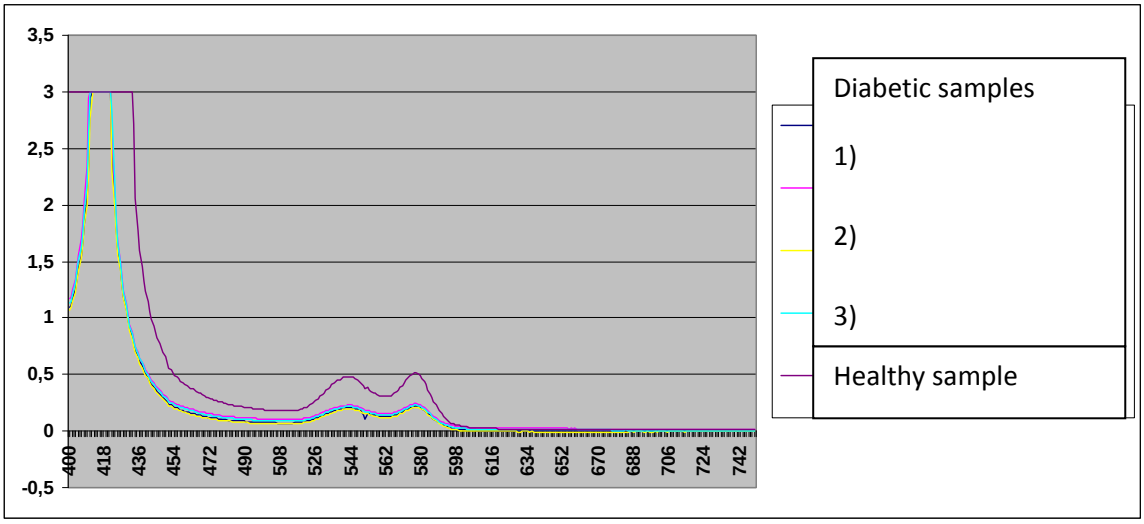
One of the main reasons in using lasers for treatments of diabetic patients is its significant effects on increasing the micro circulation of bloods. It has been reported regularly that by using low level laser beams the healing process improve significantly. In diabetic cases, it has been shown that by using a right laser beam clinician can heal a wound that usually would end through amputation process. However, how to choose the right lasers and what is the suitable dosage, have always been the primary question asked by the clinicians. In this paper, we have employed spectrophotometry method to find a suitable way for choosing right wavelengths. Lasers ranging from 532nm (130 mw) to 1064 nm(280 mw) have been used as the source of light creating Gaussian beam mode. 80 samples of blood have taken from 40 diabetic and 40 healthy people. Optical parameters such as absorption, reflection and transmission are considered and investigated, carefully. The numerical numbers obtained for optical parameters of healthy samples are different from the diabetic samples regardless of age and gender. We can choose this method to come up with the right protocol.



SESSION A9

40
THE EFFECTS OF LOW POWER LASER THERAPY WITH DIFFERENT WAVELENGTHS IN ACCELERATING WOUND HEALING ON DIABETIC RATS

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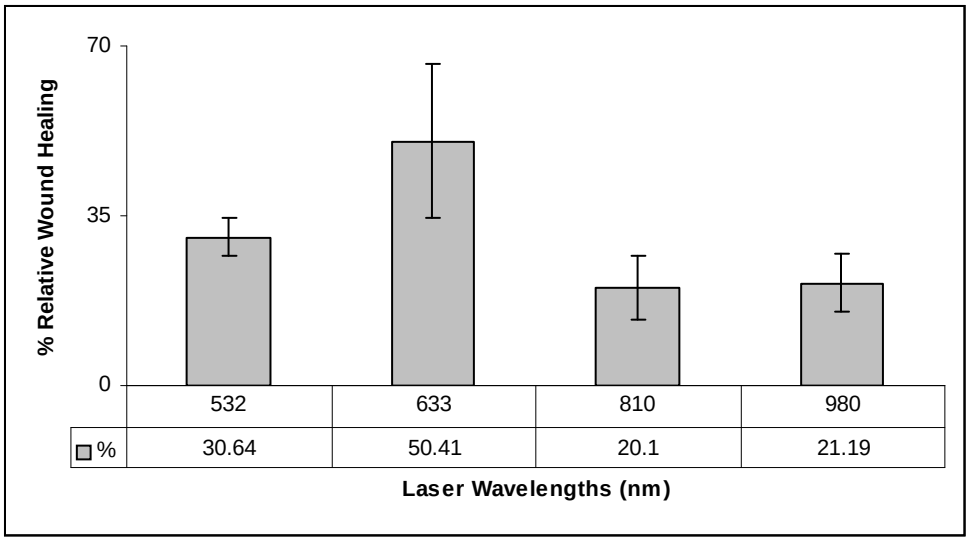
Objective: The effects of accelerating wound healing on diabetic rats were evaluated using low power laser with different wavelengths.
Materials and Methods: Male Sprague-Dawley rats were used. Streptozotocin (70 mg/kg) was applied for diabetes induction. An oval full-thickness skin wound was created aseptically with a scalpel in 51 diabetic rats on the shaved back of the animals. The study was performed using 532, 633 nm, 810 nm and 980 nm lasers. Incident doses of 5, 10, 20 and 30 J/cm^2 and treatment schedule of 3 times per week were used in the experiments. The rats treated were restrained in a Plexiglas cage without anesthesia during the laser irradiation period. The control group also received the same manipulation, excluding the laser exposure. The area of wound on all rats was measured and plotted on a slope chart. The slope values (mm^2/day), and the % of relative wound healing were computed in the study.
Results: The % of relative wound healing were 30.64 at 532 nm laser, 50.41 at 633 nm laser, 20.1 at 810 nm laser, and 21.19 at 980 nm laser. There were significant differences ($P<0.001$) in the mean slope value of wound healing on diabetic rats between treatment and control groups.
Conclusion: Low power laser therapy at appropriate treatment parameters can enhance the wound healing on diabetic rats. The optimum wavelength was 633 nm in the study.



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PHOTOTHERAPY: THE NEW ANCILLARY TREATMENT MODALITY IN VETERINARY PRACTICE

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Phototherapy, colloquially referred to as light therapy, is as a treatment modality in which light of very specific wavelengths and power output is directed onto compromised tissue to optimise and accelerate healing. The application of phototherapy in veterinary care is relatively new, but is increasing steadily as more and more veterinarians are learning about the advantages and healing benefits of using phototherapy when treating patients. Veterinarians and nursing staff are also realising the potential value such a treatment modality has to offer to a clinic as phototherapy can be offered as a new service to most clients and patients. Advantages of phototherapy in veterinary patient care include: 1) shorter recovery time with less invasive surgery required to obtain healing and wound closure, 2) reduction in inflammation, 3) lower risk of infection, 4) reduction and prevention of swelling and bruising, 5) reduction in pain and 6) optimal healing with minimal scar tissue and less proud flesh formation. Phototherapy offers an exciting, affordable, ancillary approach to the treatment of wounds, infectious and inflammatory conditions within the veterinary field. Phototherapy is an enjoyable treatment modality for animal patients thereby assisting patient and owner compliance and making treatment more successful. Clinical cases show that phototherapy offers hope to the "hopeless" cases, aiding treatment of chronic, non-healing and even viral conditions, improving client and work satisfaction while adding value to the veterinary practice. Veterinarians and nursing staff alike are now able to offer an exciting new service to their clients. Clients embrace new technology and are prepared to pay a premium for a service which offers pain relief and allow their pets to recover sooner and with fewer complications.

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HISTOLOGICAL EVALUATION OF THE LOW LEVEL LASER EFFECT ON REGENERATION OF SCIATIC NERVE IN DOG

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Aim: The purpose of this experiment was to investigate the direct effect of Low Level Laser on re-establishment of functional capacity of axonal regeneration in the experimentally crushed sciatic nerve.
Methods: This trial was conducted on 10 adult male mixed bred dogs, which were divided into two groups of (control & experimental) 5 dogs each. The right sciatic nerve was exposed in each dog under deep general anaesthesia then it was completely crushed using artery forceps within 5 seconds. No treatment was given to control dogs where as the first experimental group, dogs were subjected were subjected to Low Level Laser (Mustang 2000) daily for 10 minutes for 15 days. The samples from crushed sites were collected on day 60 for evaluation of histological changes. Analysis was done using Microsoft Excel, SPSS (ANOVA) Tukey test
Results: The right hind limb complete paralysis clinically was observed in all dogs of two groups, immediate after full recovery from anaesthesia. The positive effect of and Low Level Laser was observed on second week on skin wound healing and increasing physical activity in dogs of experimental group. The longitudinal section of normal nervous tissue showed neural fibres with compact Schwann cells in one direction having epineuron, perineuron and endoneuron.Odema between neural fibres with cloudy appearance of neural fibres replaced with esinophilic materials with destruction of axon and myelin sheath was observed in crushed tissue. Increase in number of cells, oedema and irregular arrangement of Schwann cells with no trace of normal neural fibres. The single nucleus of lymphocytes, macrophages, even atrophy and degeneration of neural fibres were seen in control samples. There was little haemorrhage between bundles of neural tissue with increase foci of schawnn

cells, regeneration of neural fibres arranged with few foci of irregular fibres with presence of epineuron, and endoneuron were characteristics changes of treated tendons
Conclusions: Application of Low Level Laser leading to Local stimulation of affected tissues at the site of surgery including skin, muscles and nervous tissues revealed to have drastic and positive effect on neural regeneration and regaining muscular strength too in dog.

43
BLUE LIGHT PHOTOTHERAPY ERADICATES METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) *IN VITRO*

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Background: Infections with MRSA remain a growing public health concern, prompting the need to explore alternative treatments instead of the on-going effort to develop stronger drug-based therapies. We studied the effect of two wavelengths of blue light on two strains of MRSA—US-300 strain of CA-MRSA and the IS853 strain of HA-MRSA—in vitro.
Methods: We cultured and plated each strain, following which bacteria colonies were irradiated with 0, 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 25, 30, 35, 40, 45, 50, 55, or 60 Jcm^{-2} energy densities—just once. Specimens were incubated at 35^{o}C for 24 h. Then, digital images obtained were quantified to obtain colony counts and the aggregate area occupied by bacteria colonies.

Results: Each wavelength of blue light produced a statistically significant dose-dependent reduction in both the number and the aggregate area of colonies formed by each bacteria strain ($P < 0.001$). Maximum eradication of the US-300 (92.1%) and the IS-853 colonies (93.5%) was achieved within 10 minutes of irradiation with each wavelength. The longer the irradiation the more bacteria were eradicated. However, the effect was non-linear as increases of energy densities between 1.0 and 15 J cm^{-2} resulted in more bacteria death than similar increases between 15 J cm^{-2} and 60 J cm^{-2}.
Conclusion: At low doses, blue light photo-destroys HA-MRSA and CA-MRSA in vitro; raising the prospect that phototherapy may be an effective clinical tool in the on-going effort to stem MRSA infections.

PHOTODYNAMIC THERAPY

SESSION B1

44
COMBINATION THERAPY OF CANCER USING LASER LIGHT, RED LIGHT ABSORBING DYES AND NANOPARTICLES

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Photodynamic therapy (PDT) has been established as a new modality for some medical indications during the last two decades. The principle of this modality is that the photosensitizing drugs preferably accumulate in a lesion and produce active oxygen species such as singlet oxygen ($^1O_2$) which destroy the lesion. The metallophthalocyanine (MPc) dyes are a family of promising photosensitizers for PDT used in both preclinical and clinical studies [1].

Quantum dots (QDs) are nanoparticles which have attracted widespread attention from various fields (such as their use as fluorescence probes in biological labelling) [1]. The combination of QDs with MPc photosensitizers may lead to indirect activation of the photosensitizer's fluorescence *via* the photoluminescent quantum dots through a process called fluorescence resonance energy transfer (FRET).

Hyperthermia (HPT) is a type of treatment in which body tissue is exposed to high temperatures to damage and kill cancer cells or to make cancer cells more sensitive to the effects of radiation and certain anticancer drugs. Recent advances in treatment of tumours is towards the synthesis of bi-functional agents that allows the combined action of PDT and HPT. This is expected to result in tumour damaging based on both heat dissipation (HPT) and light photosensitization (PDT). HPT is achieved by using nanoparticles of iron oxides (magnetic fluid, MF). Thus this work describes the combination of QDs or HTP with MPc for bimodal agents for PDT.

1. R. Bonnett, In Chemical Aspects of Photodynamic Therapy, Gordon and Breach Science Publishers: Amsterdam, 2000.
2. M. Idowu, J.-H. Chen, T. Nyokong, ***New J Chem***. 32 (2008) 290-296 .

45
PHARMACOKINETICS OF 5-AMINOLAEVULINIC ACID INDUCED PROTOPORPHYRIN IX IN PATIENTS WITH BASAL CELL CANCER

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Fluorescence diagnostics using Alasens (a preparation on the basis of 5-aminolevulinic acid, ALA) has been developing in Hertsen Moscow Oncologic Institute since 1999.

Material and methods: Fluorescence of ALA-induced protoporphyrin IX (PPIX) in skin, in tumour lesions, blood, and urine was excited with 442 nm and 532 nm laser irradiation. "D-Light System" fluorescence equipment

(Karl Storz Gmbh, Germany) was used for the detection of the Alasens-induced PPIX fluorescence in tissues. Local fluorescence spectroscopy was performed with "Spectrum" diagnostic apparatus ("Claster", Russia). OMARS-89 ("Dilor", France) was used for fluorescence spectrometry in blood and urine samples and for study of PPIX micro distribution in tissue sections.

Fluorescence investigation has been performed in 43 patients with single or multiple basal-cell skin cancer. Alasens was applied to 31 patients in 20% ointment on the tumor lesion and on the skin of the whole anatomic area of the tumor. 12 patients took the solution of Alasens *per os* in the dose of 30 mg/kg of body weight.

Results and conclusions: Study of PPIX pharmacokinetics showed that no increase of its level in blood and in urine above physiologic levels was detected in patients with local Alasens administration. PPIX blood level increased in 6-9 hours after *per os* Alasens administration. Maximum level of pigments in urine was detected 9 hours after the intake of the medicine in 66.7% of patients. Heterogeneous distribution of PPIX in normal skin of various body areas was noticed after the intake of Alasens. Maximum PPIX accumulation in tumor tissue was detected 3-6 hours after Alasens intake.

Microspectroscopy has shown that PPIX accumulation level in basal cell cancer tissue after topical application is 5-7 times higher than after systemic administration. However, PPIX synthesis after local application was restricted to the surface layer of the tumor (not more than 2 mm deep) whereas after oral Alasens intake it was detected in the whole tumor nodule (up to 11 mm deep).

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INTRAVITREAL BEVACIZUMAB (AVASTIN) IN COMBINATION WITH PHOTOSENS PHOTODYNAMIC THERAPY FOR CHOROIDAL NEOVASCULARIZATION

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Purpose: Choroidal neovascularisation (CNV) often leads to severe vision loss and is becoming increasingly prevalent as the aging population grows. Age-related macular degeneration (AMD) is the most common cause of CNV, but CNV also affects younger people with pathological myopia, ocular histoplasmosis syndrome, angioid streaks and idiopathic disorders. To examine the 6-month results for patients with choroidal neovascularization (CNV) who were treated with combination therapy with photodynamic therapy (PDT) and anti-vascular endothelial growth factor (VEGF) therapy.

Material and methods: 4 patients with classic subfoveal CNV secondary to age-related macular degeneration (AMD), 6 patients with CNV secondary to pathological myopia (PM), 1 patients with angioid streaks occurred at 6-months intervals were observed. Standardized protocol refraction, visual acuity testing, ophthalmologic examinations, color photographs, fluorescein angiography were used to evaluate the results of photodynamic therapy with Photosens (SSC "NIOPIK") (0.2% solution of mixture sulfonated aluminium phtalocyanine 0.05 mg/kg, intravenously). combination with 1.25 mg intravitreal bevacizumab (Avastin) Need for retreatment was based on fluorescein angiographic evidence of leakage at 3-month follow-up intervals.

Results and conclusions: At the end of the 3-month minimal fluorescein leakage from choroidal neovascularization was seen in 2 patients. Patients with fluorescein leakage from CNV underwent repeated injections of intravitreal bevacizumab. At 6-month leakage decreased angiographically in 11 eyes. Significant reductions of central foveal thickness measured by OCT were observed in all patients. Significant and sustained visual acuity improvement was possible after only one cycle of treatment. Our study finds it feasible to use combining PDT (Photosens) with intravitreal bevacizumab as an effective alternative treatment of patients with classic subfoveal choroidal neovascularisation.

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EFFECT OF PHOTODYNAMIC THERAPY ON A LUNG CANCER CELL LINE (A549)

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Photodynamic therapy (PDT) is a photochemotherapeutic process which is used for the treatment of cancer. It involves the activation of a photosensitizer in the target tissue by visible light at a specific wavelength to induce tissue destruction due to the production of singlet oxygen. Numerous studies have shown that PDT induces cell death via apoptosis or necrosis.
This study aimed to determine the effect of a newly synthesized metallated phthalocyanine photosensitizer on cell morphology, cell viability, cell proliferation, cell membrane damage, DNA damage and cell death pattern using a lung cancer cell line (A549) following photodynamic therapy.
Lung cancer cells were divided into 4 groups. Group 1 was an unirradiated control not treated with a photosensitizer. Group 2 was photosensitized at a concentration of 10 μM but not irradiated. Group 3 was irradiated but not photosensitized while Group 4 was irradiated and photosensitized at a concentration of 10 μM. Laser irradiations were done using a diode laser emitting 636 nm with an output of 110 mW at 5.3 J/cm^2. Changes in cellular responses were evaluated by cell morphology, ATP cell viability, Trypan blue cell viability, Alamar blue cell proliferation, LDH membrane integrity, DNA damage Comet assay and Annexin V-FITC apoptosis detection kit.
Group 1-3 showed no changes in cell morphology, an increase in cell viability and cell proliferation, a decrease in cytotoxicity and no DNA damage. These results suggest that irradiation or photosensitizer alone has no effect on the lung cancer cells since the cells remained viable and showed no evidence of damage. Group 4 showed changes in cell morphology, a decrease in cell viability and proliferation and an increase in cytotoxicity, cell death and cell membrane damage. The results indicate that metallated phthalocyanine at a concentration of 10 μM is an effective photosensitizer that induces cell death by apoptosis in lung cancer cells.

SESSION B4

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CANCER CELL DEATH INDUCTION MECHANISMS BY SECOND GENERATION PHOTOSENSITIZERS

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Cancer remains one of the most dreaded diseases as well as one of the major contributors to mortality worldwide. Photodynamic cancer therapy utilizes the activation of a photosensitizer which upon irradiation by laser, sets of a series of events referred to as type II photochemical reactions leading to the formation of singlet molecular oxygen ($^1O_2$). In turn, this compound promotes cell death. The ideal cancer treatment modality should not only cause tumour regression and eradication but also induce a systemic antitumour response, essential for the control of metastatic tumours and long term tumour resistance. Second generation photosentizers such as metallosulphophthalocyanines are currently being investigated as potential photochemotherapeutic agents showing great potential.
Our research, conducted on a number of different cancer types including lung, breast and oesophageal, using a selection of metallosulphophthalocyanines, with different central metals, has contributed to, not only determine the cytotoxicity of these photosensitizers, but it has also identified the mechanisms of cell death introduced.

Conducting cell viability and proliferation, cytotoxicity as well as a range of tests to determine mechanism of cell death including flow cytometry, DNA fragmentation and Western blot analysis for selected marker proteins, results indicate that metallosulphophthalocyanines are highly effective in causing cancer cell death. Different cancers respond differently to the concentration and variety of photosensitizers used. In addition, the selection of photosensitizers also affects the mechanism of cell death in different cancer types. Necrosis appears to be the major mechanism whereby cancer cell death is induced although contribution of apoptotic factors to facilitate this process is not excluded.

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THE CHANGES OF TUMOUR VOLUME AND WEIGHT AFTER PDT: AN ANIMAL STUDY

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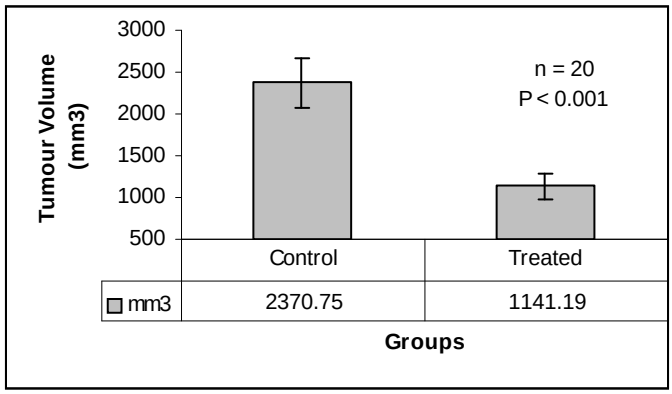
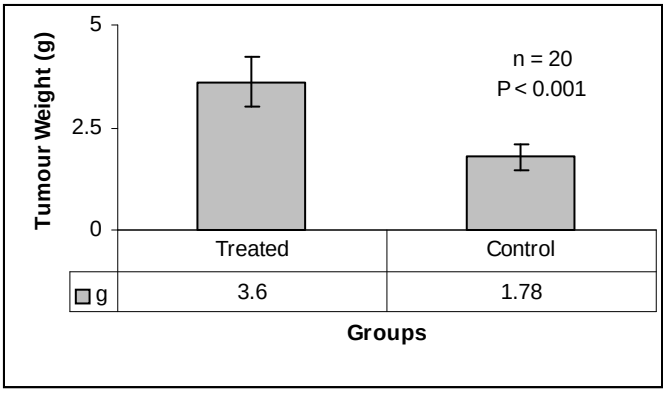
Objective: The changes of tumour volume and weight were determined and evaluated after PDT using topical ALA cream on nude mice.

Materials and Methods: Nude mice were used in the study. Undifferentiated thyroid carcinoma (UTC) was implanted in the right flank of the mice after anaesthesia. When the tumour size reached about 345 mm^3, all mice were divided randomly into treatment group (n=10) and control group (n=10). 5-aminolevulinic acid (ALA) cream was applied as topical photosensitizer to tumours in treated mice. The cream was left on for 6 hours as a retention interval and the tumours were irradiated by 633 nm diode laser with incident dose of 60 J/cm^2. All mice were sacrificed on 21 days after PDT, the tumour volume and weights were determined.

Results: Mean tumour volumes were 1141.19±153.74 mm^3 in treated group and 2370.75±300.42 mm^3 in control group on 21 days after PDT. Mean tumour weight were 1.78±0.32 g in treated group and 3.60±0.60 g in control group on 21 days after PDT. There were significant differences ($P<0.001$) in mean tumour volume and weight between the treated group and control groups after PDT.

Conclusions: PDT is effective in delaying the growth of UTC on nude mice using topical ALA cream and laser light with appropriate parameter. ALA cream as a topically applied photosensitizer was effective, safe and convenient in PDT.





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EXAMINATION OF NOVEL DIODE IRRADIATION SOURCES FOR EXPERIMENTAL PHOTODYNAMIC THERAPY

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One of the directions for improving photodynamic therapy (PDT) is the development, experimental examination, and introduction into wide clinical practice of novel long service life devices for PDT that could be easily manufactured and operated.

Experimental prototypes of light diodes with 640±28 nm, 670±31 nm, 685±15 nm, and 810±42 nm irradiation wavelength and with irradiation power density from 30 mW/cm^2 to 120 mW/cm^2 were developed in "FGUP SRC NIOPIK".

These diodes were tested on mice with transplanted malignant tumors (C-26, S-37, LLC, and EC). Antitumor efficacy of PDT performed with Alasens (500 mg/kg, *per os*), Hexasens (1000 mg/kg, *per os*), Photosens, Phthalosens, Cholosens, and Chlorin *p6* cycloimide derivative (CYC, from 0.5 to 5 mg/kg, i/v) was evaluated when such diodes were used as light sources. Drug-light interval varied from 15 min to 24 h. The following parameters of the irradiation were used: power density from 30 mW/cm^2 to 100 mW/cm^2, and energy density from 50 J/cm^2 to 360 J/cm^2.

It has been shown that Alasens- and Hexasens-based PDT (λ=640±28 nm), Photosens-based PDT (λ=670±31 nm), Cholosens-based PDT (λ=685±15 nm), and CYC-based PDT (λ=810±42 nm) inhibited experimental tumor growth from 51% to 100% (14th - 27th days of observation). It also increased animal life span by 21% – 90%. For some tumor types, photosensitizers, and irradiation parameters, complete recovery from malignancy was observed in some animals.

Thus, it has been shown that examined diode light sources can be useful for PDT with photosensitizers absorbing 640±28 nm, 670±31 nm, 685±15 nm, and 810±42 nm wavelength light. They may be used for the development of reliable and inexpensive therapeutic irradiation sources for PDT in humans.

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THE IN VITRO EFFECTS OF LASER IRRADIATION ON HUMAN BREAST CARCINOMA AND IMMORTALISED HUMAN MAMMARY EPITHELIAL CELL LINES

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Objective: The aim of this investigation was to compare the cell proliferative effects of a range of doses of low level laser therapy (LLLT) at wavelengths of 780, 830 and 904 nm on human breast and immortalised human mammary epithelial cell lines *in vitro*.

Background Data: LLLT is used in the clinical treatment of post-mastectomy lymphoedema, despite safety information being limited and circumstantial. This research was the first step in systematically developing guidelines for the safe clinical use of LLLT in the management of post-mastectomy lymphoedema.

Materials and Methods: Human breast adenocarcinoma (MCF-7), human breast ductal carcinoma (MDA-MB-435S) and immortalised human mammary epithelial (SVCT and Bre80hTERT) cell lines were irradiated with a single exposure of laser at 0.5, 1, 2, 3, 4, 10 and 12 J/cm^2 (λ=780 nm) and 0.5, 1, 2, 3, 4, 10 and 15 J/cm^2 (λ=830 and 904 nm). MCF-7 cells were further irradiated with two and three exposures of all three laser wavelengths. XTT colorimetric assays were utilized to assess cell proliferation 24 hours after irradiation.

Results: SVCT cell proliferation significantly increased after exposure to a range of doses at 780 and 904 nm irradiation. MDA-MB-435S and Bre80hTERT cell lines showed negligible effects with one exposure from all three wavelengths and no dose response relationships were noted. MCF-7 cells irradiated with 780 nm laser demonstrated an increasing dose response relationship after one exposure and a decreasing dose response relationship after three exposures. The MCF-7 cells irradiated with 904 nm laser demonstrated a decreasing dose response relationship after two and three exposures.

Conclusion: Despite certain doses of laser increasing MCF-7 cell proliferation, multiple exposures had no effect or a decreasing effect on dose response relationships. Before a definitive conclusion can be made regarding the safety of LLLT for post-mastectomy lymphoedema, further *in vivo* research must be conducted.

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THE EFFICACY OF PHOTODYNAMIC THERAPY ON HUMAN METASTATIC MELANOMA CELLS

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Photodynamic therapy (PDT) is a photochemotherapeutic process which may be used for the treatment of skin cancer. PDT requires the use of a photosensitizer that, upon entry into a cancer cell is targeted by laser irradiation to initiate a series of events that contribute to cell death. PDT utilizes a light-sensitive dye, known as a photosensitizer, which is activated by a light source at a specific wavelength. Literature shows that normal cells have a lower uptake of the PDT compound when compared with tumor cells however the acute cytotoxic effect of the compound on the recovery rate of normal cells is not known.

The project aimed to compare the effect of the porphyrin photosensitizer 5-aminolaevulinic acid (5-ALA)[3] and metalophthalocyanine photosensitizer[4] on a human malignant cell line producing a metastatic melanoma (ECACC-881130005). The cellular responses of the metastatic cells following PDT were assessed using changes in cell morphology, cell viability (Adenosine triphosphate luminescent viability assay and Trypan Blue), and cytotoxicity (Lactate dehydrogenase membrane integrity assay). So far the project results have shown to be

quite promising considering the photosensitizer 5-ALA is an established dye in PDT and currently is utilized as a treatment modality for some skin cancers, the novel metalophthalocyanine photosensitizer has shown to be on same level with this particular type of photosensitizer in terms of cellular viability and cytotoxicity after PDT treatment of metastatic melanoma cells.

Once the cellular responses have been established and the PDT effect of both porphyrin and metalophthalocyanine photosensitizers are compared, a model will be constructed using a co-culture of healthy human keratinocyte and melanocyte cells[5]. The effect of PDT on the co-culture will be assessed using immunological, histological and molecular-biological research based methods.

Results from this research will determine the efficacy of different photosensitizers on melanocyte and keratinocyte monolayers, as well as co-cultures in order to identify the cellular responses of healthy human skin cells and malignant melanoma cells following PDT. The study will also identify the cell death pathway (apoptosis or necrosis) that ultimately results in the destruction of these cells and so the potential benefit of PDT for malignant and non-malignant skin cancers may be further evaluated[6].

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TISSUE ENGINEERING, STEM CELLS AND MICRO-MANIPULATION TOOLS

SESSION B2

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LASER SCISSORS AND LASER TWEEZERS FOR INTRACELLULAR MANIPULATIONS

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Living cells are highly organized in space and time, which makes spatially and temporally confined manipulations an indispensable tool in research on cells. I will describe a two-photon microscope and ablation setup based on a femtosecond pulsed laser, combined with optical tweezers. We test the setup on the fission yeast Schizosaccharomyces pombe, a commonly used model organism. We show that long-term imaging can be achieved without inducing significant photobleaching or damage. We demonstrate that the setup can precisely ablate sub-micrometer structures inside living cells, which remain viable after the manipulation. Moreover, the cell nucleus can be displaced using optical tweezers and the subsequent movements of the nucleus provide information about the mechanism of nuclear positioning.
Similarly, cutting of fluorescently labeled microtubules and mitotic spindles in fission yeast can be achieved with a picosecond pulsed laser coupled to a confocal microscope. Diverse effects from photo-bleaching to partial and complete breakage are obtained by varying the exposure time. Using this system, we developed an efficient technique to generate anucleate cells, which can be used to study cytoskeleton in a nucleus-free environment, as well as the role of the nucleus in cellular functions. In conclusion, microscopy combined with laser micromanipulation technology is an elegant and increasingly used tool that helps to solve fundamental problems in biomedicine.

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LIGHT INTERACTION WITH HUMAN CENTRAL NERVOUS SYSTEM PROGENITOR CELLS

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Optimization of dosimetry and power density (intensity) is of great interest to scientists and clinicians working in the area of light therapy. Previously, we reported that 810 nm light was the optimal wavelength resulting in differentiation of normal human neural progenitor cells (NHNPC). Various combinations of dosimetry and power density for 810 nm were evaluated using *in vitro* NHNPC. NHNPC were placed into one of three treatment groups, two slides per group: 1) Control (no factors, no light); 2) Factors (no light); and 3) 810 nm Light Treated (spot size 0.78cm^2). The 810 nm Light Treated group consisted of 4 subgroups: 1) 0.01 J/cm^2 dose: 1, 5 and 19 mW/cm^2; 2) 0.05 J/cm^2 dose: 1, 5, 15, 19, 25, and 50 mW/cm^2; 3) 0.2 J/cm^2 dose: 1, 5, 15, 19, 25, and 50 mW/cm^2; and 4) 1 J/cm^2 dose: 1, 5, 15, 19, 25, and 50 mW/cm^2. NHNPC were treated for three consecutive days and the cells were killed on day seven with 4% paraformaldehyde. Images of twenty random neurospheres per group were captured digitally and assayed for differentiation by determining neurite number and length. The total neurite length for all neurites per neurosphere was determined and averaged per group. The data was analyzed using one way ANOVA with Tukey Post tests. Based on this data, total neurite length per neurosphere was increased as power density (19-50 mW/cm^2) and dosage (0.05-1J/cm^2)

was increased. Low power density (1-15 mW/cm^2) did not have an effect on total neurite length. These data suggest that there is not one optimal combination of dose and power density, but rather an optimal window of effective combinations of dose and power density for a given wavelength. The same combinations of dosimetry and power density are currently being evaluated for other wavelengths (both continuous wave and pulsed).

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PERFORMANCE EVALUATION OF QUANTUM CASCADED LASERS THROUGH VISSIM MODELING

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Our goal in this paper is to evaluate the performance of quantum cascaded lasers (QCL's). The tools that we are used are the VisSim technique along with the block diagram programming procedures. The benefits of using this modeling language are the simplicity of carrying out the performance's measurement through computer simulation instead of setting up a practical procedure which becomes expensive as well as the difficulty of its management. The roles that the parameters of fabrication can play in the characteristics of QCL's are discussed through developed models implemented by VisSim environment. In order to confirm our models and their validity on the practical applications, we make a comparison between the results obtained by our models and that experimentally published and a very good agreement is observed. In addition, these models can help designers and scientists to optimize their devices to meet their requirements.

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MICROFLUIDICS AS A TOOL FOR MICRO-MANIPULATION

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Microfluidics is a multi-disciplinary field that deals with the behavior, control and manipulation of fluids constrained to sub-millimeter volumes. It is proving to be a useful tool for biological studies, affording advantages such as reduced cost, faster reaction times and process-specific designs. A microfluidic system typically consists of a series of channels with components like pumps, valves and actuators to control the flow of fluids.

This project encompasses the design and implementation of a 24 valve controller. The controller connects 24 valves to a computer, from where a user can control the opening and closing of the valves. Different pieces of software will be developed to enable process-specific control. Possible set-ups include manual control over the valves, time-dependent control or connecting several valves in series to form a pump.

One of the applications of the system will be to automate the assembly of nano-robots. Some steps in the assembly process require interaction between precise numbers of molecules. Currently single-molecule manipulation is very difficult because of the small scale involved. Microfluidics might be the way forward for control on this level.

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THE EFFECT OF LOW LEVEL LASER IRRADIATION ON ADULT HUMAN ADIPOSE DERIVED STEM CELLS

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Stem cells are primal cells found in all multi-cellular organisms that retain the ability to renew themselves through mitotic cell division and can differentiate into a wide range of specialised cell types. Traumatic injury and age-related degenerative diseases are a major problem in South Africa and world wide. Stem cells generated could be of significant importance in treating the above diseases. Low level laser therapy can potentially enhance differentiation and proliferation of stem cells and these cells could be used in reconstructive surgery and tissue engineering. The study investigated the effects of low level laser irradiation on adult stem cells isolated from human adipose tissue. Adult adipose derived stem cells (ADSC's) were isolated from adipose tissue and cultured in DMEM medium. Semi-confluent monolayers of ADSC's were exposed to low level laser at 5 J/cm^2 using a 636 nm diode laser. Cellular responses such as changes in cell viability and proliferation were assessed. The expression of stem cell marker, β1-integrin, was also monitored by immunocytochemical live cell surface labelling and western blot analysis. Low level laser irradiation of human ADSC's at 5 J/cm^2 increased the viability and proliferation of these cells *in vitro*. Furthermore, low level laser irradiation increased the expression of stem cell marker, β1-integrin. The study showed that laser irradiation stimulates two important cellular responses namely cell viability and proliferation which indicates that ADSC's may be suitable for tissue engineering and future cell differentiation studies. Current work is focussing on the effect of laser irradiation on ADSC's differentiation into human skin fibroblasts.

LIGHT-TISSUE INTERACTION AND TISSUE OPTICAL PROPERTIES

SESSION B3

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MONITORING REAL-TIME CELLULAR UPTAKE OF SEROTONIN USING MULTI-PHOTON FLUORESCENCE LIFETIME IMAGING

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Modern ultrafast lasers provide new imaging techniques for observing chemical processes within living cells in real time. We have applied multiphoton excitation and fluorescence imaging to study serotonin uptake and release in various types of cells. Serotonin (5-hydroxytryptamine, 5-HT) is an endogenous compound located mainly in the enterochromaffin cells of the gastrointestinal tract, serotonergic neurons, mast cells and platelets. Physiologically 5-HT may act as a neurotransmitter and as a vasoconstrictor [1]. The real-time uptake of serotonin by rat basophilic leukaemia mast cell line RBL-2H3 (Figure 1) and 5-hydroxytryptophan (5-HTP) by Chinese hamster V79 cells has been studied by monitoring ultraviolet (340 nm) fluorescence induced by two-photon sub-picosecond 630 nm excitation.

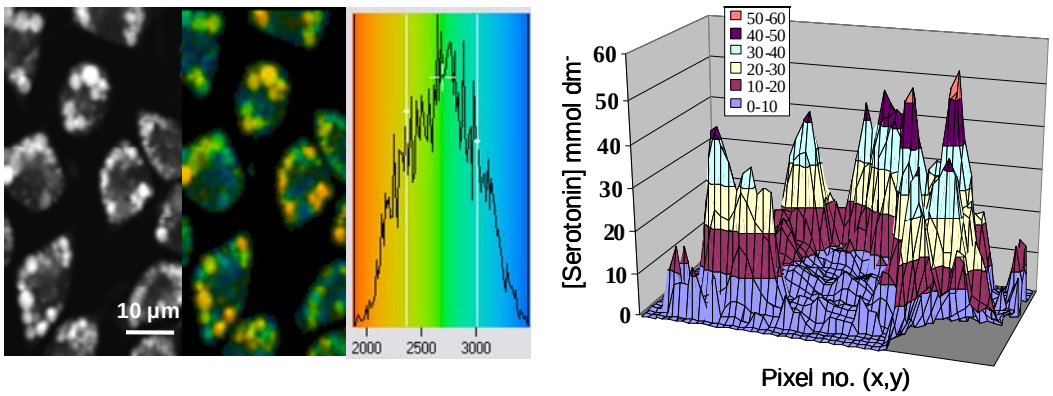

Figure 1: Left – serotonin imaged in RBL-2H3 cells showing fluorescence intensity image, fluorescence lifetime image and lifetime distribution map. Right – contour plot of serotonin concentration (mmol dm^{-3}) in a single RBL-2H3 cell.

Using fluorescence lifetime imaging (FLIM) of cells, we observe distinct fluorescence lifetimes of serotonin and 5-hydroxytryptophan according to location. The normal fluorescence lifetimes of both serotonin (3.8 ns) and 5-hydroxytryptophan (3.5 ns) in solution are reduced to ~2.5 ns immediately on uptake into the cell cytosol. The lifetime of internalized serotonin in RBL-2H3 cells is reduced to ~2.0 ns when stored within secretory vesicles [3]. The results show the potential for evaluation of serotonin distribution within a cell as well determining its intracellular concentration. Further work is now looking at serotonin uptake in the presence of drugs such as propranolol (beta-blocker) and fluoxetine (selective serotonin reuptake inhibitor) in cells.

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LIGHT DOSIMETRY IN COLLAGEN PHANTOMS IN THE PRESENCE OF MELANIN AND METHYLENE BLUE

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Low Intensity Laser Therapy (LILT) and Photodynamic Therapy (PDT) use light to promote a healthy effect and increase the patient health and life quality. Nevertheless, the knowledge about penetration and distribution of visible light in tissues were restrict to Monte Carlo´s simulation [1] and few cases to experimental measurements.
In this work we measure the transmittance and distribution of scattered visible light in collagen phantoms in presence of melanin (a natural pigment), methylene blue (MB) (a PDT photosensitizer), and Intralipid [2] to mimick the cellular organelles.
Samples were prepared with hydrolyzed collagen and Intralipid at several concentrations, in the presence of several amount of melanin or MB, holded in 1cm acrylic cuvettes. Samples were irradiated with HeNe laser (4.5 mW) and transmittance and scattered light were measured as a function of phantom compositions with a powermeter and a CCD camera, respectively.
Our preliminary results show that the light transmittance doesn´t have a mono exponential behaviour, indicating a more complicated behaviour in presence of melanin or MB. The transmittance of light was dominated by absorbance process. Mapping of scattered light (at 90^{o} of incident beam) shows that the light distribution depends on Intralipid amount as well as the presence or absence of cromophors.
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THERMAL EFFECTS FROM LOW LEVEL LASER THERAPY (LLLT) ON THE HUMAN SKIN

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Background: Early reports about LLLT speculated that clinical effects were induced by increased temperature, while newer reports point out that the clinical effects of LLLT may rather be based upon modulation of photo-chemical and photo-biological processes. Schindl (2000) emphasize that LLLT radiation is characterized by its ability to induce athermic processes. Lasers in classes 3B have mean output power (MOP) between 1 mW and 500 mW.
Little is known of whether irradiation with class 3 B lasers increases skin temperature, and whether demographic variables such as age, gender and skin color affects this outcome
Objective: To investigate the thermal effect in human skin after different doses of LLLT in healthy persons of three different age groups, both genders and white, Caucasians and black skin colors.
Method: Seventeen subjects received six different laser doses from two laser units (an 810 nm, 200 mW MOP laser, and a 904 nm, 60 mW MOP laser) with an interval of 3 minutes. The six doses were 2 J, placebo (with the same irradiation time as 2 J), 6 J, 9 J, 12 J and placebo (with the same irradiation time as 12 J). The skin

thermographs were filmed during laser irradiation and until 60 seconds after each laser dose were delivered. Data were analyzed for differences in three age groups, sex, and three skin colors.

Results: High laser doses generate an increase in temperature in the human skin. The thermal effect is conditioned by skin color, where the laser energy generates more heat in darker skin. High age influences the thermal effect too, and high doses of laser induced higher temperatures in persons under 40 years than in older subjects. Regardless of the laser doses, there were no differences in thermal effects between the sexes.

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LILT IN CARDIOPULMONARY BYPASS SURGERY - HOW TO DETERMINATE THE OPTICAL PROPERTIES AND LIGHT DISTRIBUTION IN BLOOD?

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Septicemia, extensive burning or post cardiopulmonary bypass surgery (CBP) can lead to Systemic Inflammatory Response Syndrome (SIRS), which is responsible for severe medical conditions and high costs. SIRS can lead to multiple organ dysfunction and death. In order to prevent the proinflammatory response, we intend to apply Low Intensity Laser (LIL) during CBP. Thus, in this study, our aim is to determine optical properties of blood in order to infer the light distribution during blood illumination, as results in the literature are few and inconclusive.

Diode laser (650 nm, 4 mW) and heparinated swine blood samples (whole blood and plasma) were used. Square quartz cuvettes with an optical path length of 10 mm contained the 3 ml samples. The laser illuminated the samples from the top of the cuvette and images of the 90° scattered light were captured with a CCD camera and analyzed with the software Image J.

The measured light intensity grows with depth till a maximum at 5.1 mm for blood and 3.1 mm for plasma. Beyond maximum, intensity decays exponentially with depth in both samples, with coefficients of 3.15(13) and 0.56(5) cm^{-1}, respectively. The light intensity perpendicular to incidence direction shows a gaussian distribution, better defined for plasma than for blood. With these values, we can estimate the effective attenuation coefficient for blood and plasma, based on Monte Carlo calculations for dispersive media [1]. Also, the maximum light fluence expected inside the sample can be inferred, with the aid of the lateral light distribution.

Using the analysis of the 90° scattered light allowed the calculation of blood optical properties. The method is easy to use and promising in giving good indications of light distribution inside the irradiated volume.

SESSION C6

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NATIVE FLUORESCENCE SPECTROSCOPY OF ORAL NORMAL MUCOSA: PRELIMINARY STUDY IN HUMANS

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When components of the human tissue, such as collagen and elastic fibers, flavins and some proteins, are excited by ultraviolet radiation they become strongly autofluorescent and present their native fluorescence in the 450 to 500 nm region (blue-green). When any constitutional tissue alterations occurs, pathological or otherwise, the autofluorescence may be modified. Hence, this optical phenomenon can be considered a reliable method for early diagnosis.

Study Design: Preliminary Clinical study. Purpose: to establish standard parameters for the native fluorescence of normal oral mucosal sites that could help in the diagnoses of early compared with spectra of pathological alterations, through comparison of spectra.
Material and Methods: The native fluorescence of the oral mucosa of 50 healthy adults selected at the Ambulatory of ENT and Multidisciplinary Laser Unit, Faculty of Medical Sciences, UNICAMP, were collected using a “plug in” spectrometer, a computer and optical fiber. Data related to six distinct predefined sites in the oral cavity were obtained, using an ultraviolet light source developed at our Laser Laboratory with the help of a local industry.
Results and Discussion: Overall, the 300 spectra obtained presented similar fluorescent bands and peaks. The degree of fluorescence differed significantly according to the type and site of the mucosa.
Conclusion: The results of this pilot study suggest that the native fluorescence spectra of healthy oral mucosa should be standardized in order to be used in non-invasive diagnoses.

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THE EFFECT OF LOW LEVEL LASER IRRADIATION ON DOG SPERM MOTILITY IS DEPENDENT ON POWER LASER APPLICATION

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Biological tissues respond to Low Level Laser irradiation and so does dog sperm. Among the main parameters to take into account when irradiating a biological tissue is the output power. Laser power importance is well known in the therapy field but not in suspended cells as is the case with sperm. By means of a Computer Aided Sperm Analysis (CASA) we have studied the effects of a 655 nm continuous wave diode laser irradiation at different output powers with a dose of 3.3418 J on sperm motility. After an eosine-nigrosine stain to establish its quality, the second fraction of fresh dog sperm was divided into 5 groups, 1 control and four to be irradiated respectively with an average output power of 6.84 mW, 15.43 mW, 33.05 mW and 49.66 mW. At times 0 and 45 minutes from irradiation, pictures were taken and CASA analysed. The motility parameters analysed were: curvilinear velocity, progressive velocity, straightness, wobble, average path velocity, linearity, mean amplitude of lateral head displacement, beat cross frequency and the total motility. At time 15 minutes after irradiation a hypoosmotic swelling test was done. Results: laser irradiation effects mainly appear right after irradiation. Different output powers affect differently dog semen motility parameters being the highest

output power that shows the most intense effects after irradiation, both immediately after treatment and 45 minutes later. Concomitantly, significant changes in the motile sperm subpopulation structure of the treated ejaculates were linked to the application of the utilised different output powers. Remarkably, laser application prevented the decrease of the sperm motility properties over time for at least 45 minutes. These results indicate that the activating and function sustaining effects of laser on dog sperm motility are related not only to the wavelength, but also, to the power in which laser is applied.

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SUN IS LIFE

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SUN is LIFE = The Natural Law of Planet Earth
LIFE = Low Intensity Synchronised Photons
LASERLIFE = ArtificallySynthesizedSynchronizedSolarPhotons
Solarphotons = Biophotons = Laserphotons = Harmless Light of Healing
The Harmless Healing effects of Low Intensity LASER Light have been witnessed as reliably reproducible by a Medical Revolution for more than 40 years. To date, to the best of my knowledge, the actual mechanism of action has not been logically explained within our vast worldwide community of this wonderful people's revolution.
Thankfully, on the 4th July 1998 I was lucky enough to be introduced to the benefits of LILT by 2 pioneers, Professor Edmund Wong and Dr Garrett Lee who travelled from the USA to Sydney, Australia to spread the good word.
All weekend long I was amazed at the benefits demonstrated. I dutifully left their training with my trial SOFT LASER in hand. I had been a migraine sufferer since I was 8 years old. I spent the next 7 days, 12 hours a day, treating myself, constantly radiating the neurons of my brain, until suddenly I realised the LASER produced synthetic SUNLIGHT!! That you can have TOO much of a good thing, too many endorphins was the result of so much energy. That mania occurs most often in the spring in both poles of the globes.
I have spent the last 10 years reproducing the benefits of Laser produced SUNLIGHT, knowing it was its coherent, synchronized properties that enabled me to seek out and find injured, diseased, malnourished cells emitting Non-Coherent, Un-Synchronized photons to Re-Energize them back to healthy balanced cells with coherent photons.
Then last week I discovered the brilliant work of Professor Fritz-Albert Popp of Germany who detected the coherence of Bio Photons detailed in a paper of 1999. This confirmed the equation I deduced was correct: SOLARLIGHT is LIFE. I wish to thank Dr Lutz Wilden who was a great colleague and wonderful friend.

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EFFECT OF LOW– LEVEL LASER THERAPY ON SKIN FIBROBLASTS OF STREPTOZOTOCIN–DIABETIC RATS

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Objective: This study explored effects of low–level laser therapy (LLLT) on cellular changes in cell culture and organ culture of skin from streptozotocin–diabetic (STZ-D) rats.

Background Data: Skin and its fibroblasts are impaired in diabetes. Therefore, healing of skin wounds, are impaired in diabetic patients. The positive effects of LLLT on complications of diabetes in patients and animal models have been shown.
Methods: Diabetes induced in rats by streptozotocin .30 days after STZ injection, two sets of skin samples were extracted from skin under sterile conditions. Fibroblasts which were extruded from the samples were proliferated in vitro and another set of samples cultured as organ culture. An 24 – well culture medium contained Dolbeccos modified minimum essential medium , and supplemented by 12% fetal bovine serum were used . There were five laser– treated and their relevant sham–exposed groups. A helium–neon laser was used. Low level laser with 0.9 – 4J/cm^2 energy densities was applied four times to each organ culture and cell culture. The organ cultures were analyzed by light microscopy and transmission electron microscopy examinations. Cell proliferations were evaluated by dimethyl thiazol-diphenyl terazolium bromide (MTT) assay.
Results: Statistical analysis revealed that 4 J/cm^2 irradiation significantly increases the fibroblast numbers comparing to relevant sham – exposed cultures (p = 0.046).
Conclusion: It is concluded that LLLT resulted in a significant increase of fibroblast proliferation of STZ – D rats in vitro.

DERMATOLOGY, IMMUNOLOGY AND UROLOGY

SESSION B7

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LASER APPLICATION IN TRACHEO BRONCHIAL TUMORS

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Ninety three patients with obstructing tracheobronchial tumors were treated with Neodymium: Yttrium – Aluminum – Garnet (Nd: YAG) laser photocoagulation over a period of six years. There were sixty seven Males and 26 Females with a mean age of 44.3 years (range 6- 79 years). 21 benign and 72 malignant lesions were treated with a total 212 sessions of laser photocoagulation (mean 2.4 sessions). The anatomical distribution of lesions were as follows ; larynx 9 (three benign and 6 malignant) trachea 39 (27 benign and 12 malignant) left main bronchus 27 (14 malignant) right main bronchus 24 (14 malignant) and vocal cords – 9 (three malignant) There were 21 patients with squamous cell carcinoma, two adenocarcinomas, one adenoid cystic carcinoma, 7 cases of locally infiltrating tumors from thyroid and esophagus, 6 cases of carcinoid tumor and 16 benign lesions. Twentyone patients had a tracheostomy tube in place when treatment was started. Eighteen of the 21 patients with tracheostomy were weaned off the tube in a mean of 5.5 days from the start of the treatment. Lumen was restored in 31 patients. In the other eight lumen was achieved, but not sustained. Complications included bleeding in three cases which were managed conservatively, two cases of pneumo thorax,and four cases of bronchospasm.There were six deaths during the follow up but none attributable to the procedure. Laser photocoagulation offered effective treatment in the majority of patients with obstructing tracheobronchial tumors, with acceptable morbidity.

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ROLE OF LLLT IN PEYRONIE SYNDROME TREATMENT

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The Peyronie Syndrome (PS) is a characterized Plastic Induration of the penis that produces erectile dysfunction. The annual incidence goes from 0,3 to 3% with a prevalence of one case per 257 habitants. LLLT 904nm AsGaAl was used to help medical treatment of PS after many sessions it improved mobility and it reduced indurations. But once the teatment was finished the problem reappeared. Now we know more about PS, aetiology and the process, but the treatment doesn't change and the medical or surgical treatment are not enough.

Association of local treatment with 905nm diode laser with natural supplementation (Omega 3, silica, enzymes, Coenzyme Q10), strict restriction of bad fats and also a control of excess of proteins, reduces the number of laser sessions and permits maintenance of the satisfactory results 1 year afer the local treatment is finished.

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LIGHT AND IMMUNITY

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Efficiency of the low-power visible and nIR light in many human disorders is to a significant degree due to its impact on the immune system. Numerous studies indicate a normalizing effect of this radiation both on the innate (antigen-independent) and on the adapted (antigen-dependent) immunity. It is not necessary to irradiate projection of immunocompetent organs, large blood vessels, and wounds. We have proven that when penetrating into skin down to the dense network of superficial microvessels where blood circulates very slowly, light produces in its small volume structural-functional changes of T- and B-lymphocytes (Lm), natural killers (NK), monocytes (Mn), neutrophils (Nt). In 30 min, these changes are recorded in all circulating leukocytes. Leaving blood flow Nt and Mn penetrate into tissues and function there according to the light-mediated «program», while Lm migrate to thymus and peripheral lymphoid organs, than again come into circulation, and together with blood return for a short period of time to bone marrow. Due to these events the systemic immune response to the light sessions develops. According to our data, 30-60 min after irradiation of the volunteers' lumbar-sacral zone (D = 15 cm) with polychromatic light (480-3400 nm, 95% polarization, 40 mW/cm^2, 12 J/cm^2) there occurs activation of phagocytosis of Mn and Nt, the secretion of bactericide proteins by Nt, an increase of the NK cytotoxic activity against human tumor cells K-562; after 24 h – spontaneous and mitogen (PHA)-induced DNA synthesis in cytotoxic CD8+T-Lm increases, the Lm subset is corrected, while their amount rises by the end of the 10-day course. The changes also involve the humoral immunity and cytokine status: the IgM and IgA levels increase, concentration of circulating immune complexes decreases, the amount of proinflammatory cytokines (TNF-a, IL-6) falls, the levels of anti-inflammatory factors (IL-10, TGF-b1) and IFN-g increase. These effects can comprise mechanism of activation of the anti-infectious and antitumor immunity.

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HOW THE EFFECTS OF PHOTOTHERAPY ON THE NEUROENDOCRINE IMMUNE SYSTEM MODULATE WOUND HEALING

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The healing of skin injuries is controlled by nerves, hormones and cytokines. Together with peripheral neural c-fibers, cytokines initiate acute inflammation, an essential part of the healing process. Many cytokines are produced by:

- cells of the skin-associated lymphoid tissue (SALT)
- blood-borne cells that originate in the bone-marrow and enter the injured tissue.

These and the cutaneous c-fibers are readily accessible to photons and susceptible to their direct effects.

The components of the neuroendocrine immune system (NEIS) are linked by nerves and vessels, many capillaries being located in the dermis and granulation tissue. Photons have ready access to cells in transit through these vessels, modifying the activity of some of these cells directly. For example, cytokine release can be stimulated. These cytokines can be transported to, and effect indirectly, distant cells that have not been exposed to photons. Systemic as well as local changes can therefore be produced by the exposure of a wound and to phototherapy.

Investigations into the direct and indirect effects of phototherapy on the SALT and other components of the NEIS will be reviewed. Its cells are affected by cytokines, some of which can activate or deactivate specific cell types, while others attract to wound sites defensive immune cells and stem cells that can transform into fibroblasts. Phototherapy can affect the synthesis and release of cytokines and neural activity, modulating wound healing.

The importance of treatment parameters and the physiological status of the target cells in determining outcome will be emphasized. The clinical significance of the effects of phototherapy on the control of wound healing will be considered and future research proposed.

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EFFECTIVE THERAPY OF LOW LEVEL LASER IN 810 NM WAVELENGTH ON SEVERE ACNE

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Objective: To explore the effective treatment of low level Laser (LLL) in 810 nm wave length at 186 cases with severe acne in a face, an upper chest, a neck and an upper back, in both ways of local lighting and acupointing around loci, on the basis of a general antibiotic formula.
Methods: 186 patients with severe acne were selected from the department of out-patient in the hospital, and the sex ratio was 1:1.5 (male: female), ranged age from 17-58 years old (mean age 31.25±8.63). Before treatment, all cases were scored according to the assessing schedule of 4-point, and those with serious heart problems, chronic infectious disorders and long-term use of corticosterone drug were ruled out of the trial. A sham placebo and single antibiotic groups were carried out throughout the trial. The Laser treatment device, 810 nm wavelength, work power 5-1200 nw, and effect power 4-8 Joules / cm^2 , was produced by Sandon Co. in Seoul, South Korea. Every treatment included the acupointing around loci 5 minutes per point and locally lesion lighting 10 minutes per area, and a course consisted of at least 6 treatments with the program once a day. Then, the therapeutic trial was assessed as the above schedule went after two courses were finished.
Results: The mixed remedy of both Low level laser with antibiotic formula produced better response, total effective rate 96.45±13 % and fail rate 3.46±2.53 %, than the sham placebo and single antibiotic control groups. Meanwhile, it also showed less scar formation and hypopigmentation or even skin whitening than both control groups did. (see Table and Fig)
Conclusion: The results suggest that low level laser treating severe acne had cosmetically an efficacy against scar formation and hyperpigmentation in post-inflammation of acne by the ways of locally lesion lighting and acupointing by low level laser. It further demonstrates that LLL remedy will an alternative physiotherapy available for some inflammatory lesions of severe acne.

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TREATMENT OF AN EXTENSIVE INFANTILE HEMANGIOMA WITH A COMBINATION OF ND-YAG LASER AND INTENSE PULSED LIGHT (IPL) SYSTEM

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Introduction: Pediatric vascular lesions can be medically threatening and psychologically distressing to patients. Recently, lasers and light systems are used more for the treatment of vascular lesions due to their noninvasiveness, ease of use, and short recovery time. More recently pulsed laser and intense pulsed light techniques have further improved results and reduced side effects. We report here a case of extensive infantile hemangioma treated with an Nd-YAG laser and IPL combination.
Case: A five months old girl with an extensive hemangioma involving his right pectoral and axillary region extending up to the right forearm complicated with a widespread infection and bleeding, underwent a 530nm, 67 Hz (On: 5ms; off: 10ms), 22 J/cm^2 green intense pulsed light emission with a 1×5 cm hand-held crystal probe for 30 sessions, combined in the early 6 sessions with a 1064 nm, 90 J/cm^2 Nd-YAG laser (spot size: 3mm), in a monthly routine. Total therapeutic period was 17 months. Broad-spectrum antibiotherapy was initially applied to control the infection, and local application of a layer proliferative agent (Phenytoin®

ointment) was administered to promote the connective tissue proliferation, as well. After 25 sessions, the vascular lesion resolved in about 90 percent of its surface area without any adverse reactions; and after the 30^{th} session of therapy the lesion completely resolved.
Discussion: Treatment of the infantile vascular lesions using lasers have reported and studied previously. However, this is the first case of such extensive infantile vascular lesion treated with the intensive pulsed light combined with the Nd-YAG laser. This could be considered as a basis to describe new therapeutic protocols for complicated infantile vascular lesions.

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EFFECTS OF LOW LEVEL LASER THERAPY ON ACUTE INFECTIOUS PROCESS *PSEUDOMONAS AERUGINOSA*-INDUCED IN MICE

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Low level laser therapy (LLLT) is used to promote wound healing and has been applied in many therapeutic protocols. Some studies have shown that LLLT can increase cell proliferation, release inflammatory mediators, accelerate wound healing and modulate inflammatory process. However, studies about its action on infectious process and immunological response are still scarce.
This study aimed to investigate the effects of LLLT on cutaneous acute inflammatory lesion caused by *Pseudomonas aeruginosa* infection by digital evaluation.
Sixteen male BALB/c adult mice were anesthetized and divided into two groups: A (control - no irradiated) and B (laser therapy). The left paw of each animal was inoculated with 50µL of *Pseudomonas aeruginosa* (~$5x10^6$ cells) while right paw received PBS. After six hours, the group B received a single laser irradiation (= 660nm, P= 50mW) with fluence of $3J/cm^2$ and the probe was used punctually in contact with the skin. Mice were photographed under the same conditions of distance, lighting and settings. All digital images were analyzed using ImageJ software to measure the induced bacterial infection swelling. The paw swelling evaluation was carried out before laser therapy and after 16h and 24h.
Both groups presented the same comportment on swelling during experimental period. Besides, the group irradiated by laser showed a significantly swelling decrease at 24h after treatment when compared to the control group. No side-effects were observed in the laser group.
Under the conditions investigated in this study, LLLT does not increase bacterial infection and could reduce infectious inflammatory swelling.

MOLECULAR IMAGING & OPTICAL COHERENCE TOMOGRAPHY

SESSION B8

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EXPERIENCES AND THE USE OF OCT IN UROLOGY

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Optical coherence tomography (OCT) is an innovative technique for diagnosis of morphological change in scattering tissues. While it is in common use in ophthalmology the possible perspective of OCT in other medical faculties is not discovered. In this presentation the impact of OCT-techniques in urology will be demonstrated.
Two different OCT-devices, specially prepared for clinical use, were tested. OCT-scans for superficial inspection in direct vision (e.g. bladder wall inspection) was performed by means of the IMALUX-system. In case of a cylindrical geometry (e.g. urethra, ureter) the LightLab-system was introduced. First the optical resolution was determined on phantom probes experimentally. Then the degree of encrustation on urologic catheter was evaluated by OCT-techniques. Furthermore the exact positioning of different kind of catheters within cylindrical organs are evaluated. Clinically, normal and malignant tissue was inspected via OCT technique and correlated to histology.
The findings and experiences in performing this OCT-application showed that OCT assisted rating of variations in the morphology of either catheters or tissues could be performed. The application of the OCT-probes into the organ needs a special handling and the development of guidance systems. OCT-data may become a non-invasive information source for the clinician for evaluating the clinical situation. In combination with a certain localization technique (e.g. fluorescence) the next step to receive an “optical biopsy technique” by evaluating the depth of a lesions seems to be reached. Further OCT-investigations in other clinical disciplines should follow.

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OPTICAL COHERENCE TOMOGRAPHY (OCT) EVALUATING LOW INTENSITY LASER EFFECTS ON WOUND HEALING

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Low intensity laser therapy (LILT) has been studied for several years and it presents beneficial effects in several clinical conditions including wound healing. The purpose of this study is to assess via a noninvasive method, the optical coherence tomography (OCT), the effect of LILT on wound healing.
The experimental design used 15 male Swiss mice that were imaged using OCT before injury, immediately after injury and at days 2, 5 and 7 post-wound. The injury was created at the back of the animals using a cylindrical punch (4mm). The animals were alienated in two groups: a control group (CG) and an experimental group (EG) that received a single laser irradiation at day one, 30 minutes after injury. The irradiation was performed with a diode laser (λ=660nm, P=40mW), spot size of 4mm^2, during 100s with radiant exposure of 4J/cm^2 and irradiance of 1.0W/cm^2. A qualitative imaging-based scoring system was used to evaluate the OCT images by five calibrated blind analyzers. The degree of inter-rater reliability was verified by Fleiss’s kappa statistics.

The overall observations showed that 48h after injury both groups presented a thin bright layer covering the wound area, without evident signs of contraction or epithelial migration, and without differences between groups. At day 5, differences were noted between groups recognized through a more expressive tissue contraction with epithelial migration in the EG. The statistical analyses showed that at this point the groups were considered different with a Fleiss's kappa value of 1 indicating almost perfect agreement. At day 7, the differences between groups persisted and the overall velocity of wound contraction was greater in the EG.
These preliminary findings suggest that LILT accelerates the wound healing even with a single application in the initial inflammatory phase and that OCT would be a helpful tool to investigate LILT dosimetry-related questions.

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NON-LINEAR MICROSCOPY AND ITS APPLICATIONS FOR THE STUDY OF THE STRUCTURE AND DYNAMICS OF BIOLOGICAL SYSTEMS

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Fluorescence microscopy is used extensively for the study of cellular and sub-cellular structures and dynamics *in vivo.* Fluorescence techniques can suffer from photobleaching and heat dissipation into the surrounding media and sample. However, parametric processes such as second harmonic generation (SHG) and third harmonic generation (THG) do not involve transfer of energy to the medium and are free from photobleaching. Laser scanning nonlinear optical microscopy where there is tight focusing of the light and a high numerical aperture THG, SHG and multi-photon excitation fluorescence (MPF) signals are produced simultaneously. Such a technique has been used to study the structures and dynamics of cellular and sub-cellular systems in vivo.
SHG is produced where there are chiral structures and interfaces. THG signals are propagated when there is an interface and a break in symmetry. THG can be enhanced by multi-lamellar structures such as those found in chloroplasts or mitochondria.. Many naturally occurring structures show harmonic generation effects. In such situations there is no requirement for dyes which could potentially disrupt the systems normal functionality. SHG and THG are also sensitive to changing electric potential gradients. Mitochondrial ATP synthesis and signal transduction in neurons involve the movement of ions across membranes. Hence this technique is ideally suited to investigate dynamic processes in biological samples.
This talk will describe the technique and optical system of a non-linear multi-modal microscope and some of the data acquired.

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EFFECTIVENESS OF THERMOLUMINESCENT CRYSTALS FOR DIAGNOSTIC RADIOLOGY DOSE AT 70 TO 120 KVP

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Introduction: TL detectors can particularly be used for the absorbed dose measurements performed with the aim to investigate cases where dose prediction is difficult and not as part of a routine verification procedure. In this thesis, the applicability of TL detectors was studied in different clinical applications. Particularly, the major phenomena (e.g. energy dependence, sensitivity to high LET radiation, reproducibility) affecting on the precision and accuracy of TL detectors in the dose estimations will considered in this work.

Materials and methods: Thyroid surface dose of 120 adult patients (in four groups) who underwent chest examination by conventional and spiral CT-Scan of three pitches Factor will assess. In many ways CT scanning works very much like other X-ray examinations. Very small, controller amounts of x-ray radiation are passed through the body while different tissues absorb the radiation at different rates.

In this research the entrance skin dose (^{2}ESD) on the thyroid position of the patients and staff was directly will measure during the above examinations using the TLD-100 dosimeters which will read out with a TLD reader. Based on the ICRP 60 report, since the thyroid is a superficial body organ, the measure ESD AT thyroid position will taken as the absorb dose to this organ. For the calibration of the TLD, first the annulations of the TLDs will done in a high temperature oven (Attach 1500, Exaction Co.LTD) for a period of one hour at 400 ^{0}C and then for 24 hours at 80 ^{0}C.
With plain radiology, an image of the inside of the body is capture when special film is exposed to the absorb x-rays. With CT, the film is replaced by an array of detectors that measure the x-ray profile. For this purpose thermo luminescent dosimeter and TLD-100 chips will apply Patient doses (entrance skin dose (^{2}ESD) will normalize 10 BMI, patient weight, scan length, combine ^{1}BMI and scan length. Average and normalize average doses or four groups will compare and t-student test will use to examine weather.
Results: Then, after carrying out the BS or UGI examinations, the TLDs will read out. Then, after applying their relevant correction factor, calibration factor and energy correction factor, the average value of the TLDs will calculate in terms of mGy from which the value of the control TLDs (two TLDs) will subtract. The results will analyze statistically using a statistical package.
Conclusion: During the fluoroscopy procedures all radiographic parameters such as the kVp, mA, fluoroscopy time of direct exposure to the thyroid, the number of the whole radiographs performer, the number of the radiographs during which the thyroid will expose directly and also the amount of the filtration, type of the films and the intensifier screens will record.

PAIN MANAGEMENT

SESSION B9

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A SYSTEMATIC REVIEW OF THE LITERATURE OF THE EFFECTS OF LASER IRRADIATION ON PERIPHERAL MAMMALIAN NERVES: RELEVANCE TO THE PAIN RELIEVING EFFECTS OF LOW-LEVEL LASER THERAPY

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Background: Low-level laser therapy (LLLT) is increasingly used in the treatment of acute and chronic pain. Strong evidence from several systematic reviews and randomised controlled trials supports the efficacy of LLLT in neck pain [1], tendinitis [2] and osteoarthritis [3] and other painful conditions. Neural inhibition has been proposed as a mechanism for LLLT efficacy in pain relief [4, 5]. We therefore undertook a review of the literature to identify the effects of laser irradiation (LI) on electrophysiology and morphology of peripheral nerves and how such effects modulate pain.
Methods: We searched computerized databases, reference lists and consulted relevant experts. Using *a priori* inclusion and exclusion criteria we identified 38 relevant studies encompassing 82 experiments.
Results: In human studies pulsed and continuous visible and continuous wave (cw) infrared LI slowed conduction velocity (CV) and reduced the amplitude of compound action potentials (CAPs). In animal experiments infrared LI suppressed CV and electrically and noxiously evoked action potentials including response to inflammatory mediators [6]. Specifically, 830nm, cw, LI inhibited fast axonal flow, and decreased both mitochondrial membrane potential and ATP within axons [7].
Conclusion: This review identifies laser-induced inhibitory effects in a diverse range of human and animal peripheral nerve models. Such effects provide a mechanism for reduction of acute pain by direct inhibition of Aδ and C fibres. In chronic pain, we propose that spinal cord changes induced by LI in the periphery can induce long-term depression of pain via central neuroplasticity resulting in clinical pain relief.

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THE PROSPECT FOR INTERSTITIAL USE OF LOW AND HIGH INTENSITY LASERS RATHER THAN CONVENTIONAL SURFACE APPLICATION

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It is possible to use a low or high intensity laser source deep in the tissues rather than from the conventional surface aspect. A hollow needle can be employed to take a laser fiber (e.g. pulsed NdYAG) to a planned site such as a nerve or trigger point under local anesthesia. Positioning may be guided by the use of anatomical landmarks, palpation and/or diagnostic ultrasound. This form of therapy is well described with radiofrequency sources, where continuous wave high intensity can be used for nerve ablation, or pulsed low intensity for a claimed selective effect to interact with small pain fibers without damage to large touch fibers (pain relief without numbness). This type of application merits further exploration with laser sources to plan research and develop techniques and suitable apparatus.

This paper sets out to describe:

1. The established role of interstitial laser therapy for the selective treatment of such lesions as cavernous hemangiomas (including ultrasound monitoring).
2. Comparison with the use of radio-frequency or cryosurgery.
3. Laboratory in vitro studies comparing laser coagulative versus non-coagulative regimes using thermographic camera viewing.
4. Charge coupled device (CCD) camera studies to compare penetration/attenuation for surface versus interstitial laser usage.
5. Initial clinical results for laser nerve ablation.
6. Initial clinical results for laser selective nerve effects.
7. Initial clinical results for laser treatment of intractable trigger points.
8. Prospects for future interstitial laser usage including development of suitable apparatus with disposable fiber tips and impedance detectors.

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THE IMPORTANCE OF THE DOCTOR-PATIENT RELATIONSHIP IN PAIN MANAGEMENT

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When treating patients who are in pain, we as clinicians tend to focus primarily on treating the physical aspects of the painful condition, while failing to recognize the importance of communication and the emotional connections we make with the patient and their treatment. Without realizing it, clinicians are often missing out on crucially important parts of therapy that are often overlooked and can tremendously increase the success of the treatment. The quality of communication a clinician has with a patient will have a direct consequence on the outcome of the treatment.

The study of the interaction between psychological processes and the nervous and immune systems of the body is known as Psychoneuroimmunology (PNI). Much of this growing field of science stems from work done by Hans Selye and shows the remarkable similarities between the cellular responses seen with laser light and the results seen with communication. This concept was recently illustrated during a presentation at the WALT

2006 conference in which a study linked the success of treatment using a laser with and without prayer (1), concluding that “using prayers in LLLT results in better chronic back pain therapy outcome and reduced treatment period to one session”.
In addition, the concept of Emotional Intelligence, which is “the capacity for recognizing our own feelings and those of others for motivating ourselves and managing emotions well in ourselves and our relationships”, will be discussed with emphasis on Empathy and Social Skills. (2) We as clinicians need to utilize Emotional Intelligence as a tool to enhance the quality of our communication skills and thus improving our treatment modalities.
This presentation will discuss the science behind the connection of communication and positive physiological responses, with emphasis on various skills that can be utilized by clinicians during low level laser therapy. These concepts are vitally important parts of therapy that are largely overlooked, yet can substantially improve the outcome of treatment sessions.

1. A new approach to treating chronic low back pain using low level laser acupuncture therapy. Dr Dhiya Houssien WALT 2006 proceedings
2. Working with Emotional Intelligence by Dan Goleman Bantam Books 1998

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DOSE THRESHOLDS AND EFFECT MECHANISMS FOR PAIN MANAGEMENT WITH LASER

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Arguably, the two most important aspects regarding laser phototherapy for pain management are those of effect mechanism (to determine the most appropriate application) and of dosing parameters. In a series of clinical studies over more than 15 years, we have attempted to clarify these factors - this presentation will summarise the outcomes of our research to date.
Our initial investigations demonstrated that the central descending inhibitory (endogenous opioid) system was involved in the effect mechanism of phototherapy and that doses below 5J/cm^2 in the wavelengths tested, had the best effects in a chronic pain model. Subsequent research using a non-invasive clinical model in lateral epicondylalgia, has established that the descending inhibitory system (via the midbrain periaqueductal gray region) is not the sole likely origin of the treatment response; or, if it is, it plays this role for only some combinations of wavelength, dose and power output. The lateral epicondylalgia experimental model has proven viable for assessing moment-to-moment changes in physiological responses thus making it a useful tool for tracking dose-response relationships to laser in painful conditions.
Our results have confirmed the earliest observations that laser has no effect in normal (non-painful) human models and that research must be carried out in clinical/pathological models with attendant resource and ethical implications. We have demonstrated in pilot studies that repeated low doses of laser (at some wavelengths) are sufficient to stimulate physiological responses and to reduce pain in subjects with lateral epicondylalgia. The author will present the most recent results of a double-blind randomised controlled trial to illustrate the effect of repeated applications of laser phototherapy in a clinical pain model.
Despite the steps we have taken, it is clear that we need to gain more information about factors such as dosing and dose thresholds of laser phototherapy for clinical pain management.

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INTRAVENOUS LASER BLOOD IRRADIATION IN THE MANAGEMENT OF JUVENILE IDIOPATHIC ARTHRITIS

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The aim of the present study was to evaluate the response to Intravenous Laser Blood Irradiation Therapy (ILBIT) in patients with moderate and severe forms of Juvenile Idiopathic Arthritis (JIA).
20 patients (Group 1) with JIA – extensive oligoarthritis and polyarthritis types, moderate and severe forms, received ILBIT with a GaAlAs probe (3 mW, cw, 630 nm), 15 minutes each session, for 10 consecutive days, concomitantly with conventional therapy, comparatively with 16 JIA patients (Group 2 - control), who received Methotrexate remissive therapy.
As a measure of the outcome in both groups were applied the Simplified Disease Activity Index (SDAI) criteria.
In Group 1, ILBIT reduced the number of tender and swollen joins, and offered the patient a better feeling concerning his personal experience towards pain and its control. It also decreased anxiety, introversion, chronic fatigability, adapting difficulties, depressive tendency, with statistically significant difference ($p<0.05$), compared to control group.
Patients suffering from JIA who received ILBIT displayed a noticeable diminution of the SDAI score, so reducing the classification level of the disease activity from severe to moderate, with a statistically significant difference from the control group ($p<0.05$).
In conclusion, ILBIT is a good option in the field of pediatrics, in the multidisciplinary management of chronic pain in JIA.

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THE EFFECT OF LOW LEVEL LASER THERAPY (LLLT) BY THE PATIENTS WITH ACUTE LOW BACK PAIN AFTER ACUTE ISCHEMIC STROKE

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Aim of paper: Determination of the effect of low level laser therapy by the patients with acute low back pain after acute ischemic stroke.
Material and method: There have been 60 patients at the Hospital "St Sava" of an average age 60±8. Patients without low back pain and who had not had low back pain in the last six months were included in the study. These patients were given early rehabilitation after the stroke, according to the individual program. Patients were put into two comparable groups. GR A included 30 patients who were treated with low level laser therapy on tender points -8, power 40mW, fr80,1J/cm2,50sec, laser devices 808nm/200mW GaALAs ten days and GR B where the 30 patients who apart from individual program after the stroke had training of protecting movements and kinesytherapy program for the acute phase of low back pain adjusted to functional report.
Results: Patients from GR A, after the third day had a weak pain – VAS (Visual Analogue Scale) up to 3, and the pain completely disappeared after the low level laser therapy. Patients from GR B, during hospitalization and training according to their individual plan had the pain VAS up to 7, and on the day of discharging from hospital pain was VAS 3.
Discussion and conclusion: The appearance of low back pain, by the patients with acute stroke, is mostly influenced with global failure of static, bad balance when seated and when standing. The pain disappears faster by the patients treated with low level laser therapy and fast mobilization is achieved, as well as better balance when seated or standing in comparison to patients who were not treated with laser therapy.

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INTRAVENOUS LASER BLOOD IRRADIATION IN PROGRESSIVE MUSCULAR DYSTROPHY IN CHILDREN

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Progressive muscular dystrophy is a group of genetic, degenerative diseases primarily affecting voluntary muscles and its onset is generally in the early childhood. It is characterized by generalized weakness and muscle wasting first affecting the muscles of the hips, pelvic area, thighs and shoulders. Eventually affects all voluntary muscles, and the heart and breathing muscles. Survival is rare beyond the early 30s. The disease has two variants: Duchene (early and severe) and Becker (tardive and moderate).

The purpose of the paper was to present the effects of the Intravenous Laser Blood Irradiation Therapy (ILBIT) in 3 patients with Progressive muscular dystrophy (2 patients with Duchene variant and one patient with Becker variant). The patients received ILBIT with a GaAlAs probe (3 mW, cw, 630 nm), 15 minutes each session, for 12 days. The ILBIT was repeated at an interval of six months for three times.

At the end of the study one can notice an improvement of the general health and functional status, together with the reduction of the levels of muscular enzymes in the blood. The doses of the corticotherapy were also reduced.

ILBIT had a major contribution in reducing the symptoms and also of the laboratory findings in all the three reported patients with progressive muscular dystrophy and it is a good complementary therapeutic option in this discouraging condition.

The study was performed within the pharmacological and clinical research platform for non-oncological and oncological pain mechanisms – paediatrics compartment.

PHYSIOTHERAPY, RHEUMATOLOGY & LASER ACCUPUNCTURE

SESSION C1

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LOW LEVEL LASER THERAPY IN LATERAL ELBOW TENDINOPATHY. A SYSTEMATIC REVIEW AND META-ANALYSIS WITH PROCEDURAL ASSESSMENTS

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Background: Recent reviews have indicated that low level level laser therapy (LLLT) is ineffective in lateral elbow tendinopathy (LET) without assessing validity of treatment procedures and doses or the influence of prior steroid injections.
Methods: Systematic review with meta-analysis, with primary outcome measures of pain relief and/or global improvement and subgroup analyses of methodological quality, wavelengths and treatment procedures.
Results: 18 randomised placebo-controlled trials (RCTs) were identified with 13 RCTs (730 patients) meeting the criteria for meta-analysis. 12 RCTs satisfied half or more of the methodological criteria. Publication bias was detected by Egger´s graphical test, which showed a negative direction of bias. Ten of the trials included patients with poor prognosis caused by failed steroid injections or other treatment failures, or long symptom duration or severe baseline pain. The weighted mean difference (WMD) for pain relief was 10.2 mm [95% CI: 3.0 to 17.5] and the RR for global improvement was 1.36 [1.16 to 1.60]. Trials which targeted acupuncture points reported negative results, as did trials with wavelengths 820, 830 and 1064 nm. In a subgroup of five trials with 904 nm lasers and one trial with 632 nm wavelength where the lateral elbow tendon insertions were directly irradiated, WMD for pain relief was 17.2 mm [95% CI: 8.5 to 25.9] and 14.0 mm [95% CI: 7.4 to 20.6] respectively, while RR for global pain improvement was only reported for 904 nm at 1.53 [95% CI: 1.28 to 1.83]. LLLT doses in this subgroup ranged between 0.5 and 7.2 Joules. Secondary outcome measures of painfree grip strength, pain pressure threshold, sick leave and follow-up data from 3 to 8 weeks after the end of treatment, showed consistently significant results in favour of the same LLLT subgroup ($p < 0.02$). No serious side-effects were reported.
Conclusions: LLLT administered with optimal doses of 904 nm and possibly 632 nm wavelengths directly to the lateral elbow tendon insertions, seem to offer short-term pain relief and less disability in LET, both alone and in conjunction with an exercise regimen. This finding contradicts the conclusions of previous reviews which failed to assess treatment procedures, wavelengths and optimal doses

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EFFECT OF 655 NM LOW LEVEL LASER THERAPY (LLLT) IN EXERCISE-INDUCED SKELETAL MUSCLE FATIGUE IN HUMANS

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Objective: To investigate if skeletal muscle fatigue development during repeated voluntary biceps humeri contractions could be attenuated by Low Level Laser Therapy (LLLT).
Background Data: Previous animal studies have indicated that LLLT can reduce oxidative stress and delay the onset of skeletal muscle fatigue.
Methods: Twelve male professional volleyball players entered a randomized double-blinded placebo-controlled trial, in two sessions (day 1 and day 8) with a one-week interval, both groups performed as many voluntary biceps humeri contractions as possible, with a load of 75% of the maximal voluntary contraction force (MVC). At the second session on day 8, groups were either given LLLT (λ = 655 nm) with 5 Joules at an energy density of 500 J/cm^2 administered in each of four points along the middle of the biceps muscle belly, or placebo LLLT in the same manner immediately before the exercise session. The number of muscle contractions above 75% of MVC was counted by a blinded observer and blood lactate concentration was measured.
Results: Compared to the first session (day 1), the mean number of repetitions increased significantly by 8.5 repetitions (+/- 1.9) in the active LLLT group at the second session (day 8), while in the placebo LLLT group the increase was only 2.7 repetitions (+/- 2.9) (p=0.0001). At the second session (day 8), blood lactate levels increased from a pre-exercise mean of 2.4 mmol/l (+/- 0.5), to 3.6 mmol/l (+/- 0.5) in the placebo group and to 3.8 mmol/l (+/- 0.4) in the active LLLT group after exercise, but this difference between groups was not statistically significant.
Conclusion: We conclude that LLLT seems to delay the perceived onset of muscle fatigue and exhaustion by local mechanisms in spite of increased blood lactate levels.

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THE EFFECT OF LOW LEVEL LASER THERAPY (INFRA-RED, 810 NM) ON COLLAGENASE-INDUCED RAT ACHILLES TENDINITIS: COX-1 AND COX-2 EXPRESSION AND PROSTAGLANDIN E2 PRODUCTION

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Introduction: Tendinopathy is a common disorder of the musculoskeletal system. There are controversial results about the participation of COX-isoforms and PGE2 production by tendons. Low-level laser therapy (LLLT) has demonstrated to be a powerful tool in treating tendinopathies. Here we investigate the effects of Low LLLT (infra-red, 810 nm) in collagenase-induced rat tendinitis and the behavior of COX-1 and COX-2 expression and its related Prostaglandin E2 production.
Methods: Male Wistar rats weighing about 250 g were used. After anaesthesia, local collagenase injection was performed. The animals were sacrificed by CO2 inhalation in different times. After the removal of skin and connective tissue, Achilles tendons were removed and processed for further analysis. Real Time PCR was employed to evaluate COX1 and COX2 expression in tendons. PGE2 production was measured by commercial ELISA KITs.
Result: A low level of COX1 RNA expression was attained after collagenase injection. On the other hand, a high and significant level of COX2 expression in tendon tissue, occurring 2 hours after collagenase injection was observed. Although COX2 expression was much more pronounced than COX1 in tendon tissue, we could observe that Prostaglandin E2 production was about the same (no significant difference) as a product of COX1 and COX2. LLLT was unable to produce any modification on PGE2 production derived from COX1 enzyme. However, it was quite effective in reducing PGE2 production derived from COX2 isoform. We could observe

that 1 Joule and 3 Joules of energy significantly reduced PGE2 production by the tendon tissue, while 6 Joules presented no difference when compared to collagenase group.
Conclusions: The infra-red laser radiation operating with a wavelength of 810 nm was effective in reducing important inflammatory markers in rat tendons, becoming a promising tool for treating tendon disorders.
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EFFECTS OF LOW-LEVEL LIGHT THERAPY IN TREATMENT OF OVERUSE SPORTS INJURIES IN PROFESSIONAL ATHLETES – DESCRIPTIVE PILOT STUDY

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Background information: Low-level light therapy has been used successfully for treatment of wounds and soft tissue injuries. Low level light therapy speeds up healing rate and reduces pain faster in soft tissue injuries, and this is an attribute needed in athletes. This study aims to prove that overuse injuries and chronic tendinopathies can be managed effectively and faster with addition of LLLT to other physical modalities.
Hypothesis: LLLT when added to eccentric exercises and ultrasound treatment in bursitis and chronic Tendinopathies, speeds up the healing rate as seen by VAS and ultrasound changes.
Study design: Descriptive retrospective pilot study from patient records.
Methods: A rectrospective study of data collected from records of athletes treated at the High Performance Centre, both male and female, aged between 16 and 40, who have been treated for chronic Tendinopathy, bursitis and bone bruise in any body region. A VAS pain-scoring form was filled in. A clinical diagnosis and baseline ultrasound examination to measure size and confirm the diagnosis was done. They were treated with 400mW of low level light therapy daily for 5 days. They were allowed physiotherapy and eccentric exercises (those with AT).
Results: 7 athletes treated for chronic AT started at a mean VAS score of 6,8 and after five treatments the mean pain score was 3,2. Mean tendon thickness reduction of 0,9mm was noted after 2 weeks. 3 athletes with bursitis and fluid in bursae had a mean pain score of 6,1 and after 5 treatments the pain score was 1,4. Minimal fluid was noted in the bursae compared to initial pictures. 4 athletes with bone bruising with a mean pain score of 8.2 did not show any improvement after 9 treatments with light therapy.
Conclusion: LLLT improves healing rate in soft tissue injuries in professional athletes as compared to recovery times reported in literature with the use of other modalities.

SESSION C4

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LOW LEVEL LASER THERAPY IN INFLAMMATORY DISORDERS: EFFECTS AND POSSIBLE MECHANISMS OF ACTION

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Osteoarthritis, tendonitis, and painful spinal disorders are the most common musculoskeletal disorders in modern society. Primary disorders of tendons (tendinopathies) are commonly related to overuse in sports or labor activities. Although there are few accurate data specifically relating to tendon disorders, soft tissues problems in general comprise up to 43% of new rheumatological patient referrals. The prevalence of Achilles tendinopathy in runners for example, has been estimated at 11%. However, Achilles tendonitis is not only related to the sports practice. Achilles tendon disorders can be difficult to manage successfully in the longer term, with up to 29% requiring surgery, and historically there has been a lack of agreement on management due to insufficient outcome data.

Inflammation is often present in some chronic musculoskeletal pain disorders. Particularly in episodes with flares of symptom aggravation in degenerative and systemic arthritis, increased synovial inflammatory activity may be similar to what is seen in acute injuries.

A whole range of different treatments such as locally applied or orally administered drugs, electrotherapies, joint mobilization techniques, exercise therapy, cognitive behavioral therapies, and alternative treatments are currently in use for these conditions. Non-steroidal anti-inflammatory drugs (NSAIDs) including the selective COX-2 inhibitors (COXIBs) and steroid injections have been the most prevalent form of treatment for short-term pain relief. Selective cyclooxygenase (COX)-2 inhibitors have become one of the most rapidly adopted new drug classes, with expenditure in the United States of over $3 billion in 2000.

However, there is no evidence of a difference in efficacy between selective COX-2 inhibitors and nonselective NSAIDs. Considering the increasing costs of anti-inflammatory therapy and the serious adverse reactions due to its long-term use, the investigation of new therapies is needed. The use o electrophysical agents such as electrical stimulation and low level laser therapy (lllt) have presented beneficial effects in inflammatory conditions.

We recently demonstrated that lllt was effective in reducing PGE2 production in human Achilles tendon, using a microdialysis technique to assess peritendinous inflammation in normal and symptomatic tendons.

Although some researchers have questioned the presence of inflammation in chronic tendinopathies, others have shown that structural tendon damage and ruptures correlate significantly with the degree of inflammation. In addition, loading of tendon cells increased the expression of cyclo-oxygenase 2 and the release of prostaglandin E2 (PGE2) in vitro and peritendinous PGE2 concentrations in a human experimental model of healthy Achilles tendons.

Here we present experimental data in rat tendonitis, knee osteoarthritis and controlled muscle strain models in order to contribute to the determination of the mechanism of action of anti-inflammatory Low Level Laser Therapy.

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ANALGESIC EFFECT OF ACUPUNCTURE COMBINED WITH LOW-POWER LASER ACUPOINTING ON ARTHROALGIA AND NEUROALGIA OF ELDERLY PATIENTS WITH CHRONIC PROBLEMS

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Objective: To observe the analgesic effect of TCM acupuncture, combined with semi-conductive infrared laser (low power), acupointing on arthroalgia and neuroalgia from elders, and to explore the different merits of various regimens of acupuncture combined with the laser.
Methods: On the basis of TCM meridian theory, the acupuncture formula of four regimen groups randomly administered to 146 senior patients with Chronic arthritis (31%), Post-herpetic neuroalgia (22%), Rheumatoid arthritis (21%), Vasculitis in extremities (18%) and controled placebo (8%). Anlgesic treatments of acupuncture at their precise acupoints included four ways, needling followed by the Laser irradiating at the same acupoints (Laser-Acupuncture needling), single Laser acupointing, single needling, electro-acupuncture and finger-pressing acupoints (control placebo), which was compared with stastical analysis and questionaire.
Results: The alleviative rates of pain were 92.51±12.50% (Post-herpetic neuroalgia), 61.37±8.39% (Chronic arthritis), 58.81±5.75% (Rheumatoid arthritis) and 50.39±6.30% (Vasculitis in extremities), as compared with the placebo control, respectively; while overall effective rate of the four regimens was 83.51±2.58%. Out of the regimens, the Laser-Acupuncture needling and single Laser acupointing were preferable to both single needling and electro-acupuncture ($p<0.01$ and $p<0.05$) according to the general analgesic efficacy, operative process and patient's acceptibilty.
Conclusion The Laser-Acupuncture needling is a modern, advanced and highly efficient analgesic way of the homeopathy involving the warm acupuncture, while single Laser acupointing is more applied and more acceptable than other regimens of traditional acupuncture.

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CLINICAL EFFECTS OF LOW LEVEL LASER THERAPY IN TREATMENT OF SUBACUTE LOW BACK PAIN IN RELATION WITH APPLIED DOSE

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Low back pain (LBP) is one of the most frequently health problems. Important factor in reducing chronicity is effective therapy in treatment of subacute lumbar pain. Aim of this study was been to investigate relation of clinical effects of low level laser therapy (LLLT) with applied dose in patients with acute LPB.
The prospective study concluded 1220 patinets suffering from acute LBP caused by lumbar disc syndrome that had not received any previous treatment.The patients were selected by a single blind controlled trial and classified in three groups: A group (480 patients) were treated with LLLT at dose 3J/cm^2 B group (440 patients) were treated with LLLT at dose 1J/cm^2, and group C (320 patients) were treated only with drugs. All patients were treated with nimesulid 200mg per day, and simultaneously with local LLLT applied behind the involved spine segment in stationary skin contact method on spot size of 1cm^2. Patients were treated 5 times weekly, for a total of 15 treatments with following same parameters: wavelength 904 nm, frequency 5000Hz, 100mW average diode power, power density of 20mW/cm^2 and different doses 3J/cm^2 (at group A, treatment time 150sec) and 1J/cm^2 (at group B, treatment time 50sec) at whole doses from 4 and 12 J/cm^2, and accumulated energy for all sessions of 180J/cm^2 and 150J/cm^2. Testing of optical output was performed before and after the end of trial. Following up pain with visual analogue scale, lumbar mobility with Schober measurement, and quality of life questionnaires Oswestry disability questionnaire and 12-item short form health survey (SF-12).

Subjects were evaluated before and after the treatment. Data were analyzed for differences between mean values in the groups using Student,s t test and with analytic statistical methods.
Mean values of intensity of pain have shown in group A reducing from 69±6,50 to 38±5,50, ($t=7,65$, $p<0,001$) from 76±5,50 to 50±6,50 in group B($t=5,63$; $p<0,001$), and from 74±6,5 to 62±5,5 ($t=0,65$; $p>0,05$) in group C. Mean values of Schober measurement, Oswestry score and 12-item short form health survey (SF-12) have shown better results in group A.
Results of this study show better results in group treated with higher dose of LLLT.

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LOW LEVEL INFRA-RED LASER THERAPY (810 NM) IN EXPERIMENTAL SKELETAL MUSCLE STRAIN: FUNCTIONAL AND BIOCHEMICAL EVALUATION

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Introduction: Muscle strains and other musculoskeletal disorders (MSDs) are a leading cause of work absenteeism and are among the most common and often disabling injuries in athletes. Muscle pain, spasm, swelling, and inflammation are symptomatic of strains. NSAIDs are probably the mainstay of drug treatments of acute musculoskeletal conditions, however, it´s well known side effects and its low efficacy raises the necessity of new treatments for such conditions. Here we investigate the effects of Low Level Laser Therapy (infra-red, 810 nm) in rat-induced skeletal muscle strain.
Methods: Male wistar rats (230 – 250g) were anaesthetized with halothane prior the induction of muscle strain. Previous studies have determined that a force equal to 130% of body weight corresponds to approximately 80% of the ultimate rupture force of the muscle-tendon unit. In all animals, the right leg received a controlled strain injury while the left leg served as control. A small weight corresponding to 150 % of total body weight was attached to the right leg in an appropriate apparatus and left to induce muscle strain twice for 20 minutes with 3 minutes of interval. Walking index, C-reactive protein, creatine kinase, vascular extravasation and histological analysis of the Tibial muscle were performed after 6, 12 and 24 hours of lesion induction.
Results: Low Level laser therapy in an energy-dependent manner markedly or even completely reduced Walking Index leading to a better quality of movement. C-reactive protein production was completely inhibited by Laser treatment, even more than the observed Sodium Diclofenac inhibition (positive control). Creative Kinase activity was also significantly reduced by Laser irradiations.
Conclusions*:* Low Level Laser Therapy operating in 810 nm markedly reduced inflammation and muscle damage after experimental muscle strain, leading to a highly significant enhancement of walking activity.
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THE EFFECT OF LOW LEVEL LASER THERAPY (810 NM) IN CARRAGEENAN-INDUCED KNEE OSTEOARTHRITIS IN RATS

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Introduction: Osteoarthritis of the knee (OAK) is the most common type of osteoarthritis, and its prevalence is rising in parallel with the increasing age of the population. The condition is associated with pain and inflammation of the joint capsule, impaired muscular stabilisation, reduced range of motion, and functional disability. There are plenty of evidences of clinical benefits of 904 nm Laser for treating osteoarthritis. However there are few studies addressing the effects of 810 nm laser in such conditions. Here we investigate the effects of Low Level Laser Therapy (infra-red, 810 nm) in experimentally induced rat knee osteoarthritis.
Methods: Male wistar rats (230 – 250g) were anaesthetized with halothane prior the injection of pro-inflammatory compounds. Carrageenan was administered by an intra-articular injection. After 6 and 12 hours all animals were killed by CO_2 inhalation and articular cavity was washed for cellular and biochemical analysis. Articular Tissue was carefully removed for Real-time PCR analysis in order to evaluate COX-1 and COX-2 expression. TNF-alpha and mieloperoxidase was also analysed.
Results: Low Level laser therapy was able to significantly inhibit the total number of leukocytes as well as the mieloperoxidase activity as a biochemical marker for neutrophil migration with 1, 3 and 6 Joules of energy. This result was corroborated by cell counting showing the reduction of polymorphonuclear cells at the inflammatory site, comparable to Sodium Diclofenac inhibition (positive control). Vascular extravasation was significantly inhibited at the higher dose of energy of 10 Joules. TNF-alpha was significantly inhibited by laser radiation.
Conclusions: Low Level Laser Therapy operating in 810 nm markedly reduced inflammation in carrageenan-induced knee osteoarthritis. Further studies are necessary to elucidate the mechanism of anti-inflammatory actions of laser therapy in Knee osteoarthritis.
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LASERTHERAPY APPLIED IN A EXPERIMENTAL MODEL OF MYOPATHY

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The objetive of present work was to study the effect of the Helium-Neon (He-Ne) and Gallium Arseniure (Ga-As) laser on ultraestructural level of the striate muscle and mitochondria through the observation by optical and electronic microscopy and inflammatory and of oxidative stress plasmatic markers: fibrinogen, nitric oxide, L-citrulline and superoxide dismutase, in rats with myopathy by intramuscular injections of adrenaline.
Six groups were studied: (A) control; (B) injected with 0.05 mg/rat/day of adrenaline during 5 days; (C) injected with adrenaline and irradiated during 7 days with He-Ne (8 $J.cm^{-2}$); (D) injected with adrenaline and irradiated

with Ga-As (9 J.cm^{-2}); (E) irradiated with He-Ne laser during 7 days; and (F) irradiated with Ga-As. The determination of the biomarkers was done by spectrophotometry and analyzed by Fisher test with a level of significance $p<0.05$; and for the mitochondrial quantification: Axionvision program 3.0.
Group B raised the indicators significantly with regard to the other groups ($p <0.001$), except the nitric oxide, that in group B diminished with regard to the others ($p <0.001$). The B showed mononuclear inflammatory infiltration, decrease of the number and size of the muscular fibers, high degree of mitochondrial alteration: 33.33% bigger size to the normal one, swelling, matrix clarification, abnormal separation of the internal and external membrane, 62% bigger size to the normal one and of crests.
The He-Ne and Ga-As lasers caused great variation of the inflammatory biomarkers and of oxidative stress: fibrinogen, L-citrulline and superoxide dismutase in opposition to the nitric oxide in rats with experimental myopathies and important muscular and mitochondrial ultraestructural recovery.

CARDIOLOGY, INTERNAL MEDICINE AND NEUROLOGY

SESSION C2

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LOW-ENERGY LASER IRRADIATION OF STEM CELLS FOR CARDIAC REPAIR FOLLOWING MYOCARDIAL INFARCTION

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Low-level laser therapy (LLLT) has been shown to biostimulate various biological processes. The aim of the present study was to evaluate the possible beneficial effects of implantation of mesenchymal stem cells (MSCs) that had been laser irradiated prior to their implantation into the infarcted rat heart. MSCs have been isolated from rat bone marrow and grown in culture. The cells were laser irradiated with Ga-Al-As laser (810nm wavelength), labeled with 5-Bromo-2'deoxyuridine (BrdU), and then implanted (control or laser-treated) into infarcted rat hearts. Hearts were excised three weeks later and cells were stained for BrdU and c-kit immunoreactivity. Hearts that were implanted with laser-treated cells showed a significant reduction of 53% in infarct size compared to hearts that were implanted with non-laser-treated cells. The hearts implanted with laser-treated cells prior to their implantation demonstrated a 5 and 6.3-fold significant increase in cell density that positively reacted to BrdU and c-kit respectively as compared to control. A significantly 2.5 and 2-fold higher level of angiogenesis and vascular endothelial growth factor was seen in infarcted hearts that were implanted with laser-treated cells as compared to non-treated implanted cells. The findings of the present study provide the first evidence that LLLT can significantly increase survival and/or proliferation of MSCs post implantation into the ischemic/infarcted heart, followed by a marked reduction of scarring, and enhanced angiogenesis. Other possibilities of recruitment of stem cells for cardiac repair will be discussed. The mechanisms associated with this phenomenon remain to be elucidated in further studies.

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APPLICATION OF LOW-LEVEL LASER THERAPY AFTER CORONARY ARTERY BYPASS GRAFTING (CABG) SURGERY

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Introduction: An attack of acute myocardial infarction (MI) imposes a great damage to the cardiac tissue. Operative therapeutic modalities such as CABG may enhance the myocardial perfusion in high-grade coronary vasculature occlusions. It has been shown previously that the low-level laser therapy (LLLT) significantly reduces infarct size following induction of myocardial infarction in rats and dogs. The aim of this study was to investigate the effects of LLLT on the cardiac tissue healing markers after grafting operation for coronary vessels occlusion.
Materials and methods: Thirty cases with two or three coronary vessels occlusion (2VD/3VD) underwent low-level laser therapy post-CABG, and 32 patients as control group. Diode laser (810 nm, 500 mw) used as LLLT protocol for 3 successive days post-CABG. Repeated measurements of blood cell count (CBC) and cardiac damage markers (CPK, CPK-MB, LDH) accomplished before CABG and through 5 days of LLLT post-operatively, one and 12 hours after daily laser irradiation.

Results: Mean age of participants was 57.27±11.88 years; and male-to-female ratio was 3/1. Mean cardiac ejection fraction was 49.62±9.04% before and 47.04±7.49% after CABG surgery. Serum CPK-MB level decreased significantly in the LLLT group in comparison to the placebo controls through 12 hours post-laser irradiation measurements (repeated measure analysis; P=0.046, observed power=52.5%). None of the other parameters measured, including BS, CPK, LDH and blood leukocytes, lymphocytes and neutrophiles counts, affected by the laser irradiation during the measurement period.
Discussion: It is concluded that low-level laser irradiation after CABG surgery could lower the cardiac cellular damage and help cardiac tissue repair to occur faster post-operatively. This may lower the post-operative disability and also bed rest period in these patients.

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THE EFFECT OF LOW LEVEL LASER IRRADIATION ON ADULT HUMAN ADIPOSE DERVED STEM CELLS AND THEIR DIFFERENTIATION INTO SMOOTH MUSCLE CELLS

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Stem cells are a population possessing self-renewal capacity, long-term viability, and multilineage potential. Adult human subcutaneous adipose tissue contains cells with multilineage developmental plasticity like marrow-derived mesenchymal stem cells. Laser radiation at different intensities has been shown to inhibit as well as stimulate cellular processes.

We are currently investigating the effects of low level laser radiation on adipose derived stem cells and their differentiation into smooth muscle cells. Adult human adipose derived stem cells (ADSC's) were isolated from human adipose tissue. Human embryonic kidney cell line (HEK-293) and smooth muscle cancer cell line (SKUT-1) were used as positive controls for stem cells and smooth muscle differentiation, respectively. All cell lines were cultured and exposed to 5 J/cm^2 using a 636 nm diode laser. Changes in cell viability and proliferation were monitored using trypan blue, ATP luminescence, optical density and basic fibroblast growth factor (bFGF) with indirect Elisa at 0, 24 and 48 h post irradiation. The expression of β1-integrin (stem cell marker) was monitored by immuncytochemical live cell surface labelling and western blot analysis. ADSC's were treated with heparin (positive control for smooth muscle differentiation) and were also treated with a combination of growth factors at different concentrations to induce cellular differentiation. Cellular differentiation was assessed by a change in cell morphology and the expression of smooth muscle α-actin (smooth muscle marker).
HEK-293 cells, SKUT-1 cells and isolated human ADSC's showed increased viability and proliferation after treatment with low level laser irradiation at 5 J/cm^2 *in vitro*. ADSC's and HEK-293 cells expressed β1-integrin. Low level laser irradiation increased the expression of β1-integrin. SKUT-1 cells expressed smooth muscle α-actin. Heparin treated ADSC's showed a marked change in cell morphology. ADSC's treated with a combination of growth factors also showed a change in cell morphology. The change in cell morphology confirms differentiation of ADSC's into another cell type.

SESSION C5

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LASER PHOTOTHERAPY IN THE TREATMENT OF CANCER

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Laser Phototherapy (LPT), also often named Low Level Laser Therapy (LLLT), has been used since 1963 in the treatment of medical problems. Typical indications are non-healing ulcers, pain, inflammations, nerve injury and even stroke. The main advantage is that LPT is regarded to be risk free and without real medical contraindications. However, although the mechanisms of LPT are better understood today than they were 40 years ago, some of the reported effects still remain to be explained.
Cancer, for example, is often considered a contraindication of LPT, and the treatment of cancer with LPT therefore remains controversial. Because of this, the LPT practitioner is often faced with a difficult question; should a patient with cancer be treated with LPT, or is this to be considered a contraindication?
In this context it is important to note that the literature actually shows both negative and positive results from treatment of malignant tumours with LPT (both *in vivo* and *in vitro*). This indicates that factors such as wavelength, dose and power density may influence the outcome of cancer treatment with LPT, although the importance of these factors still is poorly investigated and even understood. Further studies are therefore needed in order to outline optimal parameters for the treatment of different types of cancer.

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PRELIMINARY STUDY ON THE MUSCLE ACTIVITY BELOW THE INJURY IN COMPLETE PARAPLEGIA AND QUADRIPLEGIA TREATED BY LASERPONCTURE® AND MONITORED BY ELECTROMYOSCAN

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Preliminary study: The purpose of Laserponcture® is the recovery of functions without neural restoration (restructuring the running of the nerve impulse). Laserponcture® is the association of the channel theory, originating from traditional acupuncture, with infrared laser (Low Level Laser).
Objective:
Preliminary study of neural restoration and functional recovery
Six cases presented who received Laserponcture® : 4 complete paraplegia
2 complete quadriplegia
Material:

- 5th generation of Laserponcture® (Low Level Laser)
- Myoscan ProComp5

Comparative methodology:

- Pinprick tests
- Measurements of muscle masses
- Myoscan

Inclusion criteria:

- Complete transection of the spinal cord

Results:

- Videogram of functional abilities recovered in each therapeutic group.

Conclusion:

The results of the electromyogram recordings suggest that the nerve impulse would run without repairing the nerve tissue below the injury.

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COMPARISON BETWEEN THE EFFECT OF LOW LEVEL LASER THERAPY AND INJECTION OF BOTOX IN TREATMENT OF ANAL FISSURE (CLINICAL TRIAL, CASE CONTROL)

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Introduction: Fissure is an ulcer in the anal canal. It's induced by hard bowel movement. In examination a tear in the mucosa and a sentinel tag maybe observed .Sphincter tone is increased. Medical treatment include: stool softener and topical ointments .In the chronic form treatment is difficult. Around the fissure become sclerotic and white. Increased anal canal pressure is associated with the ischemia around the fissure. Botulinum toxin causes paralysis of internal sphincter. It inhibits synaptic transmission. The effects of LLLT are wound healing, pain reduction, vasodilatation, increase the aerobic metabolism and reduce ischemia in the site of the ulcer .The aim of this report is comparing the effect of LLLT and BOTOX injection in treatment of anal fissure.
Material and methods: 26 patients with resistance to conventional treatment were allocated in 2 groups (n=13). Case group was injected 40 units of botox (dysport) to anal sphincter. Control group had got LLLT with diode laser (AZOR-RUSSIA) RED 650 nm, P=30mW, Dose=1j/cm², IR 980 nm, P=200mW, Dose=2.4 j/cm², 5-10 sessions. We visited the patients after 2 weeks. Results were analyzed by SPSS program.
Results: In point of view of symptoms (pain, bleeding, itching, and spasm of sphincter) there was no statistically significant difference between the both group before and after the treatment. The statistically analysis showed significant difference for reduction of symptoms before and after treatment in each groups.
Conclusion: People who don't respond to conventional treatment are candidate to surgery. Injection of botox is chemical sphinctrotomy .Our study showed that LLLT can heals fissure as the same as botox injection. Botulinum toxin metabolized after 3-6 months and repeat of treatment maybe needed. LLLT has effect on wound healing, pain reduction as well as reduction of sphincter tonicity and the results maybe lasting more than botox.

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INTESTINAL HYPERSENSITIVITY TO LOW LEVEL LASER THERAPY (LLLT) (CASE REPORT)

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Introduction: LLLT is a well known and safe treatment modality that has been used in different disorders. In literature review there are limited reports for its side effects. Report the accessory and other related effects of laser therapy, helps us to achieve better acquaintances to this technique. This study aims to report a side effect of LLLT that occurred during therapy of a woman with abdominal cellulite. Cellulite describes the cutaneous dimpling of the lower limbs, abdomen, and pelvic region that is seen predominately in women. There are numerous treatments including topical, surgical, laser and other therapies.

Material and Method: A 46-yr old woman was candidate for LLLT because of abdominal cellulite. The stage of her cellulite was 3. There was no problem in review of systems and past medical histories (diabetes, hypertension…). We applied an IR diode laser (980nm, Quanta, Spa-Italy) dose=6-8j/cm², power=4W/cm², Fr= 200 Hz in a direct skin contact scanning technique, twice a week as routine of our clinic.
Results: 3 hours after the first session, the patient complained of abdominal cramps and diarrhea. Any causes of gastroenteritis like food poisoning and drug toxicity were ruled out. The second and third sessions were performed on 3 and 7 days later respectively. After these sessions she experienced the same symptoms again so because of intestinal hypersensitivity to laser we stopped the treatment.
Discussion: There are some reports for applying LLLT post operatively in intestinal paresis to increase intestinal motility (Russia). Some different possible physiological ways can explain the stimulation of intestines by LLLT like its effect on nerves (sympatic and para sympatic), improvement of microcirculation of lymph and blood, intestinal secretion… However our report conducts us to notification the other systemic effects of LLLT that can be intolerable by patients and should be more evaluated.

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MITOCHONDRIAL RESPONSES OF NORMAL AND INJURED HUMAN SKIN FIBROBLASTS FOLLOWING LOW LEVEL LASER IRRADIATION

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Laser irradiation has proved to be very efficient in speeding and improving the quality of healing in pathological conditions of diverse etiologies. However the mechanisms by which the beneficial effects are attained are not clear. Mitochondria are the primary photo-targets when cells are irradiated. The project aimed to investigate the effect of helium-neon laser irradiation on mitochondrial responses, more specifically the primary and secondary messengers of injured human skin fibroblasts.
Human skin fibroblast (WS1) cultures were modified to simulate conditions of hypoxia (hypoxic gas mixture 95% N_2 and 5% O_2) and acidosis (reduced pH to 6.7)[1] whereas the central scratch model was used to simulate a wound. Cells were irradiated in 3.4 cm culture plates with a helium-neon (632.8nm) laser using 5J/cm^2 or 16J/cm^2 on day 1 and 4. Mitochondrial responses were measured 1h or 24h after laser irradiation by assessing changes in mitochondrial membrane potential (MMP), cAMP, intracellular Ca^{2+} and ATP cell viability. These results were correlated with XTT cell proliferation, LDH cell cytotoxicity, Annexin V/PI cell damage, and Trypan blue percentage cell viability.
Hypoxic and acidotic cells showed evidence of debris and lysis confirming cell injury while a clear cell free zone was observed in the wounded model. Hypoxia and acidosis significantly reduced ATP cell viability when compared to normal un-irradiated control cells. Wounded, hypoxic and acidotic cells irradiated with 5J/cm^2 showed an increase in mitochondrial responses when compared to un-irradiated cells while 16J/cm^2 showed a significant decrease.
The study confirmed that laser irradiation with 5J/cm^2 stimulated an increase in intracellular Ca^{2+} in injured cells which resulted in an increase in MMP, an increase in ATP and an increase in cAMP, all which are pH dependent.

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INTRAVASCULAR LASER THERAPY (IVL) IN PRE-HYPERTENSION AND HYPERTENSION CONDITIONS

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Introduction: ″Hypertension," is a condition that afflicts almost 1 billion people of worldwide and it is called the silent killer because it usually has no symptoms. Some people may find it out when they have trouble with their heart, brain, or kidneys. Intravenous laser therapy (IVL) is a technique of low level laser therapy that is pioneered in Russia and refers to blood irradiation through an intravenous needle or transcutaneous venous irradiation. IVL increases oxygen content, reduces the partial pressure of carbon dioxide and thrombocyte aggregation, stimulates fibrinolysis, and normalizes tissue metabolism… The aim of our study was evaluation the immediate effects of IVL in different grades of blood pressure.

Material and Method: Nowadays, since attention has been focused on systolic BP as a predictor of coronary and cerebrovascular disease, we allocated 125 patients according to the systolic blood pressure in 3 groups: 1-Normotensive (<120 mmHg n=50), 2-Pre-hypertensive (120-139 mmHg n=50), 3- hypertensive (stage I =140–159 mmHg, n=25). All the groups were conducted for 30 minutes IVL with a 630 nm, continues laser in 2.5 mW power at the end of intravenous fibre. Pulse rate, systolic, diastolic, and pulse pressures were measured before, after, and 15 minute after the IVL. All the results were analyzed by spss program.

Results: There was no statistically significant difference for pulse rate, systolic and diastolic blood pressure in normotensive group, however the significant difference was observed for pulse rate, systolic and diastolic blood pressure in Pre-hypertensive group as for systolic and diastolic blood pressure in hypertensive group($p<0.005$).

Conclusion: IVL is an effective method for modifying factors to result a reduction in arterial pressure. It can be combined with anti hypertensive drugs in Pre-hypertensive and hypertensive patients as a modality of treatment; also it is a safe method in normotensive patients.

LASER SAFETY, DOSIMETRY, STANDARDS, EDUCATION & MANAGEMENT

SESSION C3

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METROLOGY IN LASER THERAPY

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Metrology is the science that covers all theoretical and practical aspects related to measurements, regardless of the uncertainty on every field of science and technology. In this work we define and look at some Laser physical parameters of great importance for medical application and their connections with metrology.
The continuous development of the Scientific and Industrial Metrology and the Legal Metrology offers reliable tools to guarantee safety applications of Lasers in many fields, however, the concepts and terms used are in general too complex to non experts in physics, in particular in the metrology area.
Nowadays Lasers are being used in many medical and biological applications, particularly in laser therapy. The efficiency and reproducibility of the results depend on the degree of knowledge of the operator regarding concepts such: wavelength, frequency, photon energy, color, energy, flux, fluence, mean power of continuous and pulsed radiation, maximum power of a pulse radiation, pulse repetition frequency, pulse duration, pulse time profile, diameter and divergence of beam, spatial power energy distribution (transversal electromagnetic mode), besides others. These concepts are normally found in specific texts but not so handy to surgeons and others professionals in their dally practice. Manufactures' manuals usually give practical information on secure usage for the equipment and for specific procedures, although do not enable the professional with enough information for any technical variation necessary to particular applications.
Concerned with this problem, our Institutions (Inmetro and Unicamp) have developed a directory based on metrological concepts, simple to be understood and used by professionals, helping them to perform safe and innovative procedures.

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LASER IN MEDICINE: HIGH-TECH REQUIRING HIGH QUALITY

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In medicine, laser is a phenomenon of the last few decades. In surgery, modern portable devices are able to change wavelenghts and deliver more energy than their huge and heavy predecessors. In therapy, small, strong and fully automatic devices have replaced bulky lasers occupying half of your table and emitting just a couple of milliwatts. Apart from lasers, LED`s and IPL`s are on the rise. What do all these technical miracles have in common? It is top technology and ultimate power, the higher the potential - the higher the risk. Therefore safety regulations must be improved, and observed. High-tech in your hands requires high quality in safety. Quality accreditation and certification systems may help you to take up this challenge.

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IMPROVING LOW INTENSITY LASER THERAPY WITH MONTE CARLO SIMULATION

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Knowledge of the actual dose to tissue can determine the efficiency of many processes assisted by LILT, as wound healing, pain relief and photodynamic therapy. As we have no access to the internal fluences in tissue, Monte Carlo Method (MCM) has become an important tool for dosimetry, helping to find the adequate dose that heals the injured tissue. Also, this method helps the better understanding of laser-tissue interactions.
We used the code MCML 1.2.2, 2000 [1] to simulate light distribution in Lipovenos® 10%. With the results, depth fluence distributions along various planes parallel to laser incidence were calculated. It was found that the position of maximum fluence (d_{max}) and the exponential coefficient of the asymptotic curves (μ_{as}) generated with the simulations depend on the laser-plane distance: the farther the plane, deeper is the maximum and smaller is the exponent.
To validate the simulation an experiment has been carried out, acquiring pictures with a CCD camera of the light scattered at 90° from a quartz cuvette containing 3 ml of Lipovenos® 10%, illuminated from the top with He-Ne laser. Pictures were analyzed with software Image J. The simulated results at 5.0 mm from the incidence plane are very similar to the experimental curve of light intensity with depth, whose maximum occurs at 2.3 mm with an asymptotic exponential coefficient of 3.3 cm^{-1}.
As the behavior of simulated d_{max} and μ_{as} is very regular with distance from the application point, images of illuminated tissue combined with Monte Carlo simulations can contribute with the evaluation of light intensity distribution inside injured tissue. Our results signalize that this method will improve the dosimetry process in LILT. We expect to determine internal dose distributions in simple geometric conditions as is the case of fingers or other thin regions.
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EFFECT OF DIFFERENT SKIN TYPES ON THE REQUIRED DOSE FOR PHOTODYNAMIC THERAPY

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Dosimetry (treatment planning) for traditional radiation therapy is well established in the literature. Similar dosimetry for light treatment application (e.g. PDT) is not widely available[1]. In South Africa we have a richness of cultures and ethnic groups which are a complicating factor in laser skin treatment (e.g. skin cancer).
The penetration depth of light into biological tissue is a very important parameter for the determination of the correct dose during light therapy or treatment[2]. The penetration depends on the characteristics of the light source (power, beam shape and wavelength) and the optical properties (absorption coefficient, scattering coefficient, anisotropy factor and the refractive index) of the tissue at the treatment wavelength.
Computer software is used to evaluate the light propagation properties due to changes in the structure of the skin. The thickness of the different skin layers (stratum corneum, epidermis, dermis and hypodermis) and different concentrations of the pigment melanin are used to simulate the skin on the arm, neck and forehead. This paper will discuss the effect of different laser wavelengths, skin thickness and skin tones on the calculation of the correct dose for skin related treatments.

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PLASTIC SURGERY, OTOLARYNGOLOGY & ORTHOPEDICS

SESSION C6

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LASER LIPOSCULPTURE FOR BODY RECONTOURING

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Laser liposculpture (LL) is a cosmetic application combining liposuction and laser technologies to reduce body fat. The SmartLipo® system (Cynosure Inc., Westford, MA) employs pulsed Nd:YAG laser energy to liquefy fat less traumatically than conventional liposuction (LS), allowing lighter anesthesia. Fat destruction results from delivering high-density thermal and mechanical energy in short pulses to target tissue.
Purpose: To assess the efficacy of LL in recontouring disfiguring regional fat accumulation compared to conventional LS.
Methods: 47 patients (age 22-62 [mean 38] years) treated over 9 months were compared with historical LS. Most treatments (52%) involved the hips, thighs and buttocks, 39% the abdomen, 33% the knees, calves or ankles, 33% the neck, 18% the upper arms and 10% male breast reduction. 6-18 W Nd:Yag 1064 laser was delivered at 40 Hz in 150-mJ pulses for 100 ms, with total exposure 3,600-15,000 joules. Lipolyzed adipose tissue was removed by aspiration. Patients were evaluated clinically at 1, 2 4, 12 and 26 weeks postoperatively and photographically at baseline and completion.
Results: Operative time required $\geq$30 min for each body region with LL and was longer than with LS. LL was well tolerated and no significant adverse effects occurred. All patients reported pleasing results, improved contour and tighter skin. Compared to LS, however, LL did not reduce postoperative swelling or bruising and recovery periods were similar.
Conclusions: LL safely corrects regional adiposity, refines tissue irregularities and reduces cellulite, but advantages over conventional LS mainly involve access to small or irregular zones. LL may be combined with LS, but studies comparing outcomes to other methods of body recontouring are needed.

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INCREASING DESIRABILITY OF SCARS BY LOW POWER LASERS

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Any skin damage (either surgical or nonsurgical) passing thorough dermis ends to a permanent scar which is unwanted even in the best appearance particularly for females on the face. Desirability of a scar has a wide (zero to hundred) spectrums; sometimes hardly detectable and sometimes as visible as a flashing light in darkness which makes psychosocial problems.
Using Ga As laser just after healing of new wounds (CO_2 laser resurfacing, surgery and crash wounds) dramatically affected final appearance of scars so that in comparison with usual cases that had no laser irradiation differences were significant either from point of view of patient satisfaction or medical criteria.
We had a case with 2 different methods; with and without laser therapy. At first we used CO_2 laser irradiation 4 weeks after resection of sutures and once again after 6 months new method were done and the last result was significantly better than before.
In addition to desirability of final result, redness removes sooner than before.
The protocol was 10 session (3-5 sessions per week), 4 J/cm^2, 2-14 points on the scar (based on size of scar), 1 J/point with Ga As laser.

Laser therapy must begin after resection of sutures or healing of open wounds (such as CO_2 laser resurfacing). It must be noted that laser therapy with the presented method directly on open wounds inhibits healing.

Old scars renewed at first (by high power CO_2 laser or scar revision surgery). Laser therapy on old scar is not effective because healing process is terminated.
Although laser therapy is effective other attempts such as suitable surgical techniques, high quality surgical materials and post operative cares mustn't be forgotten.
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3. Mysteries of plastic surgery

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FULL LASER IMPLANT SURGERY

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Purpose: to show, with practical cases, the alternative soft and hard tissue preparation with laser for inserting implants, in different indications like one-stage, two-stage, mandibula, maxilla, with flap, flapless, bone splitting, bone spreading, sinus lift, autogenic bone transfer, direct loading, surgical guide, implant decontamination, implant removal and soft tissue management.
Material and Methods: the Er,Cr:YSGG (2780 nm, 20 Hz, 140 µs, 6 W, 300 mJ) laser with different tips was used on patients in own private practice. Inserted implants: Tapered Screwvent, Reuters One Day and Bauer-Screw. Removed implants: Linkow Blades. For 3D planning the Simplant software was used. Membrane lifting and bone condensation was done with hand instruments. For measuring the size of the cavities sonds and drills were helpful. After flaps non resolvable sutures 4.0 were taken.
Results: in all cases sufficient primer stability was achieved, also for direct loading. Quick wound healing and hardly any pain or swelling post OP were seen. Osseointegration on x-rays show similar pictures as after conventional methods.
Conclusion: soft tissue cuts are easily and precisely done with the Er,Cr:YSGG laser using the appropriate parameters. There is less bleeding, no smear layer and always a clear operation field. The procedure is safe because the laser works superficially and there is no risk of sliding away and hurting surrounding tissues. Preparing a congruent cavity for parallel walled implants needs some skill and takes time. Macroscopic round cavities can be achieved. Hand condensation helps rounding up the cavity. Conical cavities for compression implants are easier to achieve. Preparing the spongiosa needs attention for not overheating in the depths. Water must be around the laser tip always. No drilling means patients comfort. Laser means a 'sterile' operation and no need for antibiotics. Laser application in the posterior lower region is limited due to space problems, shortness of the laser tips. Especially in the mandibula preparations are much more time consuming due to the denser bone. Although the laser is not yet a total replacement for the bur, it is already a valuable and useful instrument in all parts of implant surgery.

POSTER PRESENTATIONS

ABSTRACTS

BASIC SCIENCE & MECHANISMS OF PHOTOTHERAPY

P01
DOES THE USE OF LASER PHOTOBIOMODULATION, BMPS, AND GUIDED BONE REGENERATION IMPROVE THE OUTCOME OF AUTOLOGOUS BONE GRAFTS? AN IN VIVO STUDY IN RODENT MODEL

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The aim of the present investigation was to assess histologically the effect of Laser photobiomodulation on the repair of autologous bone grafts in rodent model. A major problem on modern Dentistry is the recovery of bone defects caused by trauma, surgical procedures or pathologies. Several types of biomaterials have been used in order to improve the repair of these defects. These materials are often associated to procedures of Guided Bone Regeneration - GBR. Twenty four animals were divided into 4 groups: Group I (control); Group II (LPBM on the bone graft); Group III (BMPs+ bone graft); Group IV (LPBM on the bed and on the bone graft + BMPs). The bed when appropriate was filled with lyophilized bovine bone and BMPs and was associated or not to GBR. The animals on the irradiated groups received 10J/cm^2 per session divided into 4 points around the defect (4J/cm^2) being the first irradiation immediately after surgery and repeated 7 times at every other day. The animals were killed after 40 days. The results of the present study evidenced that, in all treatments groups, bone neoformation was larger and qualitatively better than on non treated subjects. Controls specimens showed a less advanced repair after 40 days and this was characterized by the presence of medullar tissue, discrete amount of bone trabeculli and cortical repair. It is concluded that LPBM resulted in a positive biomodulatory effect on the healing of bone defects being this effect more evident when LPBM was performed on the surgical bed trans-operatively prior the placement of the autologous bone graft and post-operatively.

P02
INFLUENCE OF LASER PHOTOBIOMODULATION ON THE OUTCOME OF SEVERE CHEMO-INDUCED ORAL EPITHELIAL DYSPLASIA ON THE HAMSTER CHEEK POUCH MODEL

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Epithelial dysplasia on the oral mucosa may be a white, red or mixed patch that may affect several sites of the oral cavity. Chemo-induced precancerous lesions are standard model to study cancer on the oral cavity. The use of Laser photobiomodulation on the oral care is a standard procedure these days and it is known that it possesses proliferative effects on both cells and tissues depending on dose, wavelengths and other parameters. The aim of this study was to assess the effect of laser light on the evolution of chemo-induced epithelial dysplasia on the hamster cheek pouch model. Twelve animals were divided into 3 groups (n=4): Control, Laser λ660nm, Laser λ790nm. DMBA induction was carried out 3 times a week. All animals presented severe epithelial dysplasia at this stage, when animals on groups laser were irradiated (λ660nm or λ790nm, 30/40mW, Φ3mm, 4J/cm^2) at 48 h interval during 2 weeks. Chemo-induction continued during all experimental period (8 weeks). The specimens were taken and stained with HE and analyzed by a pathologist. (40x, 100x, WHO, 2005). The scores were statistically analyzed. The results showed that controls presented reduction on the level of severe dysplasia (50%) the other showed 25% of mild or moderate levels. Time also influenced the outcome of the severe level of dysplasia (**p=0.041**). On group λ660nm, 25% of the animals showed moderate levels; 50% were severe and 25% were mild. On the group Laser λ790nm a significant reduction on the level of severe dysplasia was observed (**p=0.041**) as the lesions were either mild or moderate. It is concluded that the use of λ790nm laser light significantly influenced the outcome of the evolution of severe oral epithelial dysplasia.

P03
EFFECT OF 830NM LASER LIGHT ON THE REPAIR OF BONE DEFECTS GRAFTED WITH BOVINE DECALCIFIED CORTICAL OSSEUS MEMBRANE

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The aim of the present investigation was to assess histologically the effect of LLLT (AsGaAl, 830nm, 40mW, CW, ϕ ~0,6mm) on the repair of surgical defects created in the femur of the Wistar rat. The defects were filled to bovine biological membrane (GTR). Surgical bone defects were created in n=32 divided into four groups: Group I (control – n=8); Group II (Laser – n=8); Group III (Membrane –n=8); Group IV (Membrane + Laser – n=8). The animals on the irradiated groups received 16J/cm^2 per session divided into four points around the defect (4J/cm^2) being the first irradiation (five points and 20j/cm²), immediately during surgery and repeated seven times at every 48h. The animals were humanely killed after 15 and 30 days. The results of the present investigation showed histological evidence of improved amount of collagen fibers at early stages of the bone healing (15 days) and increased amount of well organized bone trabeculae at the end of the experimental period (30 days) on irradiated animals compared to non irradiated ones. It is concluded that a positive biomodulative effect on the healing process of defects associated to the use of biological membrane on the femur of the rat.

P04
ASSESSMENT OF BONE REPAIR ON FEMUR OF RATS FOLLOWING THE USE OF HIDROXIAPATITE, BMPS, BONE GRAFT AND MEMBRANE AFTER LASER IRRADIATION 830NM

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The aim of the present investigation was to assess histologically the process of bone repair and the effect of Laser therapy (AsGaAl, 830nm, 40mW, CW, 16J/cm2 per session, divided into four points of 4J/cm2) on the repair of surgical defects created in the femur of the Wistar rat. The defects were filled to bone morphogenetic protein (bBMPs), Hidroxiapatite (bHA), associated to Membrane - RBG. Surgical bone defects were created in n=60, divided into five groups: Group I (control – n=12); Group II (bBMPs+ Membrane - n=12); Group III (bBMPs+ Membrane + Laser – n=12); Group IV (bHA + Membrane - n=12); Group V (bHA + membrane + Laser - n=12). The animals on the irradiated groups received the first irradiation immediately after surgery and repeated seven times at every 48h. The animals were sacrificed after 15, 21 and 30 days. The results showed histological evidence of improved amount of collagen fibers (15, 21 days) and increased amount of well-organized bone trabeculae at the end of the experimental period (30 days) on irradiated animals compared to non-irradiated ones. It is concluded that a positive biomodulative effect on the healing process of one defects associated to the use of bBMPs, bHA and biological membrane on the femur of the rat.

P05
ASSESSMENT OF BONE REPAIR FOLLOWING THE USE OF ORGANIC AND MINERAL BOVINE BONE GRAFT AFTER LASER IRRADIATION 830NM

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The aim of this work was to evaluate the effectiveness of the Laser (LLLT) (AsGaAl, l830nm, 40mW, CW, f~0,6mm) in the repair of bone defects submitted to organic and mineral bovine bone graft in femur of Wistar rats (n= 42). The sample was divided in 05 Groups: Group 1 (control, n= 06); Group 2 (Organic Bone graft, n= 09); Group 3 (Organic Bone Graft + Laser, n= 09); Group 4 (Anorganic Bone Graft, n= 09); Group 5 (Anorganic Bone Graft + Laser, n= 09). The irradiated groups, received seven irradiations at every 48 hours, being immediately the first after the surgical procedure. The dosimetry was of 16J/cm2 per session, divided in four points of 4J/cm2. The sacrifice periods were of 15, 21 and 30 days. The obtained results demonstrated that in the irradiated groups, it was observed the concentration of collagen fibers in the period of 15 and 21 days and for a larger bone new formation and a well organized bone trabeculae at the end of period (30 days), when compared with the control group. It is concluded that LLLT associated to organic or anorganic bovine bone graft resulted in bioestimulation effect on the repair of the bone defects.

P06

EVALUATION OF CELLULAR PROLIFERATION IN CULTURES H.EP-2 AFTER LOW LEVEL LASER THERAPY OF 830NM

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This work evaluated the behavior of the proliferation tax of H.Ep-2 cells after to be radiated with 830 nm and 100 mW, in doses of 20 J/cm^2 and 60 J/cm^2. Twenty microplates had been prepared containing a cellular suspension with 10^5 cells/ml, being 10 had been kept in nutritional deficit and 10 in standard nutrition. After radiated the cells had been evaluated in five time intervals (T0, T6, T4, T48 and T72). The cells in nutritional deficit, radiated with 20 J/cm^2, presented $p<0,05$ in T24-T48 and with 60 J/cm^2, $p<0,001$ in T48-T72. The cells kept in standard nutrition and radiated with 20 J/cm^2 presented $p<0,005$ in T0-T6 and with 60 J/cm^2, $p<0,001$ in T0-T6. The lesser doses had presented the best ones resulted. The proliferation tax does not modify under the studied parameters

P07

EFFECTS OF A POLARIZED LIGHT SOURCE (L400-2000NM) ON HEP.2 AND L929 CELL LINES: A SPECTROSCOPIC IN VITRO STUDY

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The aim of this study was to evaluate the proliferative effect of Hep.2 cells, originate from laryngeal carcinomas and L929 cells, originate from a fibroblasts line, submitted or not to polarized light in wavelength of λ400-2000nm with a energy density of 40mW, 5cm of diameter and dose of 9.6J/cm^2.Recently there has been increased interest in the propagation of polarized light in randomly scattering media, such as biological tissues, because of its potential applications, particularly in biomedical area. The illuminations were performed at the following times: T0 (24 hours after handling the cells) and T48 (equivalent to 48 hours after the first illumination). The cellular viability was assessed using MTT essay at the following times T0, T6, T12, T24, T48, T72 subsequently to T0. The results were analyzed using the Instat® software. The results showed that time had influenced the cellular viability of L929 on both control (p=0.0014) and illuminated cultures (p=0.0035). Significant difference between control (p=0.0001) and illuminated Hep.2 cells (p=0.0001) was observed. There was a significant difference between the two used types of cells illuminated when compared to their controls: Hep.2 (p=0.0001) and L929 (p=0.0002).The use of polarized light on Hep.2 and L929 cells resulted on photobiological effects that need further investigation of the mechanisms involved as this is the first study using this methodology.

P08

THE USE OF THE CO_2 LASER ON ORTHODONTIC PATIENTS SUFFERING FROM GINGIVAL HYPERPLASIA

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The present study aimed to assess, numeric and statistically, the effect of the use of the CO_2 laser on the treatment of gingival hyperplasia on orthodontic patients wearing fixed appliances. Gingival hyperplasia is a condition very frequent on patients undergoing fixed orthodontic treatment. Amongst the treatments available is the use of surgical lasers. Ten patients accepted to entry this study and signed an informed consent. Seventy five anterior teeth with gingival hyperplasia were selected to undergone laser surgery. Prior surgery the length of the crowns was measured using a digital caliper and depth of the pocket was probed. The hyperplasic gingival was removed with a CO_2 laser under local anesthesia. Immediately after surgery measurements of the length of the crown and probing were carried out and were repeated. The results were statistically analyzed and significant differences were detected regarding the length of the crown ($p=0.000$) and depth of the gingival sulcus ($p=0.000$). It is concluded that the use of the CO_2 laser was effective on the treatment of gingival hyperplasia.

P09

THE EFFECT OF THE ASSOCIATION OF NIR LASER THERAPY BMPS AND GUIDED BONE REGENERATION ON TIBIAL FRACTURES TREATED WITH WIRE OSTEOSYNTHESIS: RAMAN SPECTROSCOPY STUDY

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Bone fractures are lesions of different etiology; may be associated or not to bone losses; and have different options for treatment, such as the use of biomaterials, guided bone regeneration, techniques considered effective on improving bone repair. Laser therapy has also been shown to improve bone healing on several models. The association of these three techniques has been well documented by our group using different

models. This study aimed to assess, through Raman spectroscopy, the incorporation of calcium Hydroxyapatite (CHA ~ 958 cm^{-1}) on the repair of complete tibial fractures in rabbits treated with wire osteosynthesis (WO); treated or not with laser therapy; and associated or not with the use of BMPs and/or Guided Bone Regeneration. Complete tibial fractures were created in 12 animals that were divided into four groups: WO; WO + BMPs; WO + laser therapy; and WO + BMPs + laser therapy. Irradiation started immediately after surgery; was repeated at every other day during 2 weeks; and was carried out with λ790 nm laser light (4 J/cm^2 per point, 40 mW, ϕ ~ 0.5 cm^2, 16 J per session). Animal death occurred after 30 days. Raman spectroscopy was performed at both the surface and the depth of the fracture site. Statistical analysis showed significant difference on the concentrations of CHA between surface and depth. The analysis in each of the areas showed at the depth of the fracture significant differences between all treatment groups ($p < 0.0001$). Significant differences were also seen between WO + BMPs + laser therapy and WO ($p < 0.001$) and WO + laser therapy ($p < 0.001$). At the surface, significant difference was seen only between the treatment groups and the non-fractured subjects ($p = 0.0001$). However, no significant difference was seen between the treatment groups ($p = 0.14$). It is concluded that the use of NIR laser therapy associated to BMPs and GBR was effective in improving bone healing on the fractured bones as a result of the increasing deposition of CHA measured by Raman spectroscopy.

P10
INFLUENCE OF LASER BIOMODULATION (670NM) IN THE EXPRESSION OF TGF-B OF COLLAGEN IN HEALING

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The low level laser therapy has been described as a tissue repair biomodulator agent, attenuating the exudative phenomena and stimulating the proliferative process, in particular, the collagen synthesis. The Transforming Growth Factor-Beta (TGF-b) is an endogenous protein that stimulates fibroblasts migration and proliferation, increasing collagen and fibronectin synthesis. The objective of this study is to assess the effect of a GaAlAs laser diode (670nm, 9mW, $4J/cm^2$) in the immuno-histochemistry expression of TGF-b in standardized skin wounds, in relation to the collagen synthesis. Forty-eight Wistar rats were divided into control and irradiated groups and killed at 0, 6, 12 and 24 hours, 3 and 5 days. The sections obtained were stained with HE, Sirius Red and the TGF-b was studied with immuno-histochemistry technique. There were increased levels of TGF-b at 24 hours after the injury induction and high expression of collagen from the first 6 hours on. The Spearman correlation test was not statistically significant ($p \leq 0.05$). It can be concluded that the low-power laser stimulated the expression of TGF-b and collagen production, even in the presence of exudative phenomena after tissue injury.

P11
LASER "MICROEXPLOSIONS" OF PHTHALOCYANINES NANOPARTICLES IN TUMOR

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Earlier we have reported tumor growth inhibition using powerful laser irradiation of carbon nanoparticles in tumor [1, 2]. In present work antitumor efficiency of nanoparticles of phthalocyanines under laser irradiation in tumor blood vessels has been studied.

In vivo experiments were performed on mice with C26 colon adenocarcinoma and S37 sarcoma. Aqueous suspensions of phthalocyanine nanoparticles (average size of 200-300 nm) were injected into tail vein in doses of 3-30 mg/kg. Q-switched ruby laser has been used for tumor irradiation (wavelength of 694 nm, maximum energy density per pulse of 0.6-0.8 J/cm^2, maximum fluence per session of 60-80 J/cm^2).

Irradiation right after injection result in maximum antitumor effect increasing with increase of nanoparticles dose, energy density per pulse, fluence per session. Phthalocyanine nanoparticles provide better effect in comparison with carbon nanoparticles. Control continuous laser irradiation with the same fluence per session result in much lower efficiency.

We believe the antitumor mechanism is damage of tumor blood vessels as result of nanoparticles "microexplosions" under irradiation by short powerful laser pulses.

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P12
MODULATION OF INDIRECT NEUROTRAUMA IN ADULT RABBITS BY LOW LEVEL LASER STIMULATION IN RELATION WITH APPLIED WAVELENGTH

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We undertook our study to investigate whether transcranial application of LLL beams could modify biochemical disturbances of brainstem and systemic disturbances of cardiorespiratory function induced by moderate pulmonary blast injury (PBI) in adult rabbits in relation with applied wavelength of LLL.

A total of 42 adult rabbits were used in this study, randomly assigned in 6 groups: 1. Control 2. Intact animals treated with LLL in wavelength of 660nm 3. Intact animals treated with LLL in wavelength of 904nm 4.PBI animals LD_{50} 5. PBI animals were consequent treated with 660nm LLL stimulation 6.PBI animals were consequent treated with 904nm LLL. Blast wave with nominal peak pressure of 304 kPa was generated in laboratory conditions, using air driven shock tube. Using 904 and 660 nm diode with power density of 10mW at dose of 1J/cm2 performed laser stimulation.

The lipid peroxidation activity,activity of enzymes of antioxidative defense and systematic parameters of cardio respiratory function were measured.

Both applied wavelength of LLL significant increased the lipid peroxidation activity, but only 904nm of LLL significant increase activity of enzymes of antioxidative defense, in conditions of posttraumatic decreases of these enzymatic systems. Changes, as increasing of systolic and diastolic pressure and hear rate and decreasing of respiration rate which were noticed in group 6 and could be consequence of better functionality

of CNS. 660nm stimulation type of low-level laser not influenced significantly on systemic parameters but could attenuates free radical generation both in pulmonary and cerebral tissue after PBI. This influences of laser irradiation is effective in pathological conditions, because laser in intact animals not induce any changes in systemic parameters. Local transcranial LLL stimualtion could modulate bichemical disturbances in brainstem with consequent modification of systemic response.

P13
A METHOD FOR STUDYING THE EFFECT OF PHOTOTHERAPY WITH LOW INTENSITY LASER ON VASCULAR REACTIVITY

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Phototherapy with low intensity lasers (PTLIL) is able to enhance endothelial cell nitric oxide (NO) secretion[1] and production of vascular endothelial growth factor (VEGF)[2] of endothelial cell culture. This therapy can also increase the permeability of capillaries[3]. However, little is known about the effect of PTLIL on vascular reactivity. Thus, the aim of this research was to test a methodology for following the vascular reactivity in function of PTLIL. Thoracic aortas from 6 male Wistar rats were carefully removed and freed from all periadventitial tissue. Each aorta was divided in three aortic rings (5mm) that corresponded to control group (C – without irradiation), red laser group (RL-660nm) and infrared laser group (IRL-808nm). For both wavelengths, two points of 10 J/cm^2, 40 mW, 0.28 J and 7seconds of irradiation were performed. Aortic rings were mounted in organ chambers in Krebs-Henseleit solution, at 37^{o}C and bubbled with a carbogenic mixture (95% O_2–5% CO_2) and were connected to force transducers. The resting tension was set at 1.5 g and after a 60-min equilibration period the vessels were precontracted with noradrenaline (1x10^{-7}M) [4]. Maximal response and effective concentration 50% (EC50-1x10^{-8}M) were determined from the cumulative concentration-effect curves with acetylcholine (1x10^{-8} a 3x10^{-6}M). No difference between C, RL660nm and IRL-880nm was observed on maximal response (91.3$\pm$2.8, 93.3$\pm$2.3 and 90.4$\pm$2.7, respectively) neither on EC50 (12.3$\pm$6.7, 7.5$\pm$5.7 and 4.5$\pm$0.8, respectively). Data are expressed as mean $\pm$ SEM. Maybe the major effect of laser at vascular reactivity is noticed during and in a short period of time after irradiation. Other energy parameters should be tested and its effects observed immediately after the irradiation.

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P14
INFLUENCE OF LOW INTENSITY LASER IRRADIATION ON THE GROWTH OF NEURONAL CELLS

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Phototherapy with low intensity laser (PTLIL) is used on the recovery of neuronal disorders as paresthesia, paralysis, neuralgia and it has been demonstrating good results in this field. The effects of PTLIL were also demonstrated on *in vivo* experiments. However, little is known about how this light acts on neuronal cells. The aim of this *in vitro* study was to verify the influence of PTLIL with different wavelengths and energy densities on the growth of a neuroblastoma cell line (Neuro 2a) under stress condition. The neuronal cells were grown in culture medium supplemented with 10% fetal bovine serum (FBS) at control group and with 5% fetal bovine at irradiated groups. The cultures were irradiated with a low power laser (20mW), with a GaAlAs (780nm) or an InGaAlP (660nm) laser. For both wavelengths the energy densities 3 or 5 J/cm^2 were tested. Cell growth was indirectly assessed by measuring the cell mitochondrial activity through the reduction of the MTT test. The phototherapy with low intensity laser with low intensity laser has no effect on the growth of the cell line growth in the ideal condition (10% FBS), however when growth in nutritional deficit (5% FBS) with the irradiation of the 660nm there is a tendency to improve the cell growth.

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P15
ROLE OF LOCAL LASER THERAPY IN SUBCUTANEOUS CYSTICERCOSIS

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In the past 20 years, advances in laser technology have revolutionized their use in many skin conditions and defects present at birth. Currently, skin conditions commonly treated with laser therapy include: Tattoo

removal, scar removal, and winkle removal however response of subcutaneous cysticercosis to laser therapy was not previously reported.
Three patients attending to Nelson Mandela Academic Hospital (Walter Sisulu University) in Eastern Cape province presenting subcutaneous cysticercosis were treated with albendazol for a month (group A) and other two patients were under laser therapy as spot treatment of skin infections with an associated subcutaneous cysticercosis (group B). At the reference hospital, the laser therapy was divided into different sessions, each session lasting from 15 to 30 minutes.
Patients from group A presented calcified cysticercosis after treatment and patients from group B did not develop further calcifications. A laser treatment that wipes out drug-resistant bacterial infections may help medical doctors tackle the growing problem of local infections and may kill parasites like Taenia solium (endemic parasitic disease in the former Transkei) in a faster way avoiding the long process to calcified lesion which causes additional cosmetic problems.

P16
LASER THERAPY IN ZOSTER NEUROPATHY - HIV RELATED

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Post-herpetic neuralgia (PHN) is primarily a disease of the elderly and often refractory to treatment, however in younger patients HIV/AIDS is the commonest cause. Randomized and controlled trials have yielded several significant advances in the treatment and prevention of this disease. Treatment advances include the lidocaine patch, opioid analgesics, nortriptyline, amitriptyline, and gabapentin. However, no treatment regimen fully eliminates the pain. Improvements in prevention include prompt recognition and treatment of high-risk herpes zoster (HZ) patients with antiviral and analgesic therapies. Even with these advances, PHN remains a debilitating and painful disease. Vaccines offer the greatest promise of relief. The childhood vaccine against varicella zoster virus offers long-lasting immunity, largely preventing HZ and PHN.
Low Intensity Laser Therapy when properly applied has an infinite ability to heal. Along with a number of systemic, dermatological and musculoskeletal problems, we may be able to now add shingles to the list of conditions where Low Intensity Laser Therapy may be applied as an effective therapy.
A vexing complication is post herpetic neuralgia as these patients continue to suffer from the signs and symptoms despite treatment with conventional therapies. The pain is not relieved and can be excruciating along with multiple serious sequelae. There is some evidence that acyclovir and other antiviral drugs slow reproduction of the virus in the nerve cells but this is effective only to varying degrees and is not curative.
The efficacy of laser therapy was studied in forty six cases of post neuralgia-HIV related (PN-HIV) of different age groups (21 to 61 years) and with varying duration of illness from 3 months to 3 and a half years in the present investigation. The affected areas were irradiated from a distance of 5 cm using the probe of 12x70 watts at a frequency of 1000 Hz. each area being exposed for a time period of 5 minutes and 6 seconds. In each case the laser therapy was given for 15 consecutive days and therapeutic effect of the therapy was evaluated after 5th, 10th and 15th laser application during the treatment with the help of visual analogue scale (VAS). Patients started responding to the therapy after an average of 2.58 laser applications and VAS steadily decreased as the therapy progressed. After completion of therapy, 37 (80.4%) out of 46 cases showed excellent relief and remaining 9 (19%) cases showed partial relief that could be due to multiple factors like prolonged duration of illness, involvement of ophthalmic division of trigeminal nerve and formation of scarring and keloids. No side effects were observed during the treatment as well as during the follow up period of 10 weeks.

DENTISTRY

P17
GINGIVAL OVERGROWTH: SURGICAL TREATMENT WITH CO_2 LASER

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This study is composed a group of 20 patients with severe gingival hyperplasia selected from the Dentistry and Otolaryngology Clinics at the Clinics Hospital at Campinas State University (Unicamp).
A biopsy of the gingival hyperplasic tissue was performed as a pre-operative step. Laboratory exams were requested according to the specific individual needs of each patient. After establishing diagnoses and the basic pathology, plans were elaborated for the treatment of the selected sites. Surgical procedures were performed using a CO_2 10,6µm laser under local anesthesia with the objective of aiding the reestablishment and control of their normal physiological functions such as: masticatory, respiratory and phoniatric functions, through gingivoplasties and orientation as to the importance of oral hygiene in order to maintain these systems healthy.
The power used in the applications were determined according to the necessities of each case, varying from 8 to 12W, spot size 2.0mm, fluence of 2.5 – 4.0Wmm^2, depending upon the nature, localization and extension of the enlarged gingivae. The number of CO_2 laser applications needed for the treatment also followed the same criteria and varied from 2 to 4 sessions. Clinical evaluations, x-rays and photographs were taken before each application in order to establish posterior comparative standards. Most of the patients were under anticonvulsant, immunosuppressant and calcium channel blocker medication and many presented oral respiration, typical of enlarged gingiva.
The patients were reevaluated four weeks after finishing the laser treatment. The postoperative period was painless and bloodless in the great majority of the cases, with no need for sutures or any kind of medication. This type of conservative surgical procedure, using a CO_2 laser, gave surprisingly satisfactory results with reestablishment of normal oral functions.

P18
ORAL CAVITY HEMANGIOMAS: TREATMENT WITH CONSERVATORY LASER TECHNIQUE

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Congenital or vascular malformations are characterized clinically by appearing at or shortly after birth and can be enlarge slowly by hypertrophy. Histologically, these lesions reveal a proliferation of endothelial cells in the walls of capillaries. The treatment of hemangiomas is reserved for lesions that cause significant functional or aesthetic problems by volume and location. The objective of this work is to present a new technique , effective and minimally invasive, using CO_2 laser, denominated “CERCLAGEM” and developed in our Service. Material and Methods: 05 Patients were selected in ANT Ambulatory, that presented lesions in different sites of oral mucosa. The Cerclagem used a Sharplan 40C equipment and local anesthesia. Results: Were presented and analyzed by photo documentation and histological analysis. The Cerclagem was done with pulsed applications of high energy density in circular lesion area, promoving the sealing of the vessels. After we used pulsed low energy density on the lesion superficies, to promote a thermical effect, reducing the lesion with the substitution of vascular tissue by cicatricial tissue, according the final biopsies’.

P19

HALITOSIS CAUSED BY THE PRESENCE OF TONSILLOLITH: CONSERVATIVE TREATMENT WITH CO_2 LASER

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Objective: To study the Volatile Sulphur Compounds (VSC) halitometry profile in a population with Chronic Caseous Tonsillitis (CCT), to evaluate the relationship between presence of a tonsillolith and abnormal halitometry and to assess the impact of CO_2 Laser Cryptolysis by Coagulation (LCC) treatment in the Volatile Sulphur Compounds (VSC) halitometry of all these patients since halitosis is an important complaint.
Background Data: Caseum retention and halitosis characterize CCT. Failure of clinical treatment indicated tonsillectomy. Recently, a conservative new treatment was introduced: CO_2 LCC. It is painless, opens the crypt ostium, avoiding caseum retention. Halitometry is an objective new method for halitosis diagnosis. It measures VSC in *parts per billion* (ppb) in the breathed air.
Methods: Thirty-eight patients with CCT and halitosis complaint were selected, underwent physical examination and halitometry measurements followed by 4 sessions of LCC. The laser technique consisted of 6W applications, in scanned and unfocused mode, around crypts, following the shape of their openings (fluence 54.5 joules/cm^2) and afterwards, over the entire tonsillar surface (fluence 18 joules/cm^2). Halitometry values less than 150 parts per billion (ppb) of VSC were considered normal.
Results: LCC was well tolerated by all patients. All related halitosis improvement after LCC treatment. Eight patients (21%) had abnormal halitometry (>150 ppb) before treatment and after LCC sessions halitometry values became normal. These patients had caseum at examination. VSC measurement was reduced by 30.1% and caseum retention was significantly decreased in this group.
Conclusions: Abnormal halitometry in this population is related with caseum presence. LCC is safe, well tolerated and improves halitosis complaint in patients with CCT. Improvement was related to a decrease in caseum retention. Patients with abnormal halitometry had VSC-halitometry improvement about 30%.

P20

THE ASSOCIATION OF WAVELENGTHS IS EFFECTIVE ON THE REDUCTION OF TMJ PAIN. A CLINICAL STUDY IN A BRAZILIAN POPULATION

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Temporomandibular Disorders (TMDs) are common painful multifactorial conditions affecting the temporomandibular joint (TMJ) whose treatment depends on the type and symptoms of the TMD. Initially it requires pain control and for this, drugs, biting plates, oclusal adjustment, physiotherapy or their association are used. Lately, laser photobiomodulation have been used in the treatment of pain of several conditions including TMDs. This study reports the treatment of a selected group of 51 patients treated at Laser Center of Federal University of Bahia between 2000 and 2007. Following standard anamneses, clinical and imaginologic examination and with the diagnosis of any TMD the patients were set for laser treatment. No other intervention was carried out during the treatment. Treatment consisted of 2 sessions a week during 6 weeks. Prior irradiation the patients were asked to score their pain using a VAS. λ660 and/or λ790nm lasers were used on each session (30/40mW, ϕ ~ 3mm, ~ dose per session of 13J/cm^2, ~ treatment dose of 154J/cm^2). Eight two percent of the patients were female (~42 years old). At the end of the 12 sessions the patients were again examined and scored their pain with the VAS. The results were statistically analyzed. The results showed that 78.43% of the patients were asymptomatic and that the association of the 2 wavelength was statistically significant (p=0.03) on the patients asymptomatic. It is concluded that the association of red and IR laser light is effective on pain reduction of TMD.

P21
DENTIN HYPERSENSITIVITY CLINICAL STUDY COMPARING LILT AND LEDT KEEPING THE SAME IRRADIATION PARAMETERS

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Institute of Physics of São Carlos, University of São Paulo, São Carlos, SP, 13560-970, Brazil Dentin hypersensitivity is a common complaint associated with high dental pain. The possibility of treatment using low laser intensity allows an opportunity to minimize this clinical problem without causing any discomfort to patients. A new LED-based (light emitting diode) light source has been used as an experimental tool in some studies. The main objective was to compare these two light sources emitting in the same spectral band (red – from 625 to 660nm) to promote pain relief. A total of 6 sessions were accomplished, being three irradiation sessions and three follow-up sessions. This single-blind study compared a control group (Placebo) and two other groups with different equipments: low laser intensity treatment (LILT) and a light emitting diode system treatment (LEDT). The sensibility test (air blast) was used. The results show that there is not statistical difference between LILT and LEDT groups, however, both were better than control group ($p \leq 0.01$) in terms of treatment efficiency; there is not difference between the second and the third sessions to both treatment, it means that the third session is not necessary; finally, the improvement at the end of the entire research (follow up care of 30 days) was very expressive in comparison to pre-treatment situation for all teeth ($p \leq 0.01$). In conclusion, using this protocol, LILT and LEDT were equally effective to treat dentine hypersensitivity.

P22
INFLUENCE OF THE PARAMETERS OF THE ER:YAG LASER ON THE APICAL SEALING OF APICECTOMIZEDED TEETH

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The great number of failures in the apical surgery is directly related to the bad retro-filling of the sectioned tooth. The present study was performed in vitro and aimed to evaluate the apical infiltration in sectioned teeth by Er:YAG Laser. Twelve recently-extrated teeth were alleatory divided into two groups of six teeth each and apicoectomized as follows: Group I: apicoectomy with Er:YAG Laser (250mJ/15Hz) and Group II: apicoectomy with Er:YAG Laser (400mJ/6Hz). Specimens were immersed in dye (2% methylene blue). Root end microleakage was assessed by using stereoscopic magnifying glass (ZEISS®). Non parametric Kruskal-Wallis test was used to evaluate the results. The results showed there is statistically significant differences (p=0.0010) in the test groups, based on the physical parameters used. Group II (Er:YAG 400mJ/6Hz) presented a smaller dye leakage rate. Based on the results and within the studied parameters, the efficacy or the Er:YAG laser reducing the permeability of the cut surfaces in the remaining teeth was demonstrated, as long as proper irradiation parameters are used

P23
LASERTHERAPY IN A PEDIATRIC AMELOGENIS IMPERFECTA PATIENT

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Amelogenesis Imperfecta is the reserved term for the inherited development enamel defects, which can be classified as hypoplasic, hypocalcified, or for hypomaturation, depending on the phase of enamel formation mainly affected.
Lasertherapy can be a therapeutic instrument for Pediatric Dentistry to treat dentinal hypersensitivity in Amelogenesis imperfecta patients. It is probable that the nociceptives signs inhibition is a main component effect of this therapy. Most of lasertherapy studies for the treatment of dentinal sensibility demonstrated desensitization of hypersensitive dentine, with 60 to 90% effectiveness.
The aim of this study was to demonstrate the lasertheraphy performance in a child. Patient infantile, 8 years old, male, attended in Pediatric Dentistry Clinic of UNICSUL with complaint of dentin sensibility concomitant to aesthetic factor in superior central incisors. Clinically it presented healthy mixed dentition and Amelogenesis imperfecta. The treatment was adapted to the patient, lasertherapy, with Low Level diode Laser (λ= 650nm, energy density = 3J/cm^2, 4 applications/ weekly intervals). In the revaluation, after the end of lasertherapy sessions, regression of the painful sensibility was observed, in the sequence fluoride varnish applications were performed, light dental bleaching and aesthetic restorations. At the end of the rehabilitation treatment, it was noticed better clinical and aesthetic conditions. In that way, the treatment was efficient, easy to perform, and it acted in an accelerating way in the remission of dentinal sensibility, viable for Amelogenesis Imperfecta patients.

P24
STUDY ON HEATING GENERATED BY LASER ER:YAG DURING THE REMOVAL COMPOUND RESIN

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The object of this study was to analyze the thermal variation generated by Er:YAG laser during the preparation of a Class I cavity in the dental structure and in the removal compound resin. The sample was 30 upper human pre-molar teeth, divided into 6 groups of 5 teeth each: Group 1, preparation of Class I cavity with Er:YAG laser (350 mJ, 3 Hz, 343 impulses, 120 J, 113 seconds); Group 2, preparation of Class I cavity with Er:YAG laser (350 mJ, 4 Hz, 343 impulses, 120 J, 81 seconds); Group 3, preparation of Class I cavity with Er:YAG laser (350 mJ, 6 Hz, 343 impulses, 120 J, 58 seconds); Group 4, removal of compound resin from Class I preparation with Er:YAG laser (350 mJ, 3 Hz, 258 impulses, 90 J, 85 seconds); Group 5, removal of compound resin from Class I preparation with Er:YAG laser (350 mJ, 4 Hz, 258 impulses, 90 J, 67 seconds); Group 6, removal of compound resin from Class I preparation with Er:YAG laser (350 mJ, 6 Hz, 258 impulses, 90 J, 42 seconds). The laser used was KaVo Key 2 λ = 2,94 µm, P = 3 W, pulse duration of 250 µs, with air-water cooling. The increase in temperature during dental preparation and the removal of the compound resin was evaluated . Results : the removal of the hard dental tissues and in the removal of compound resins with the pulse frequencies 3, 4 and 6 Hz did not generate heating greater than 3.1 °C and remained within the histopathological limits permitted for pulp tissue (5.5 °C) and there is a significant statistical difference between the heating generated by the application of laser in the removal of the hard dental tissues and in the removal of compound resins ($p < 0.01\%$). The average increase in temperature of the compound resin component is greater than that of the hard dental tissues.

DERMATOLOGY, IMMUNOLOGY & UROLOGY

P25
EFFECT OF CRYOGEN-COOLED 595 NM PULSED DYE LASER FOR TREATMENT OF HYPERTROPHIC SCARS AND KELOIDS IN IRANIAN PATIENTS

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Introduction: Hypertrophic scar and Keloid formation occurs as a result of abnormal wound healing. Despite the high prevalence of hypertrophic scars in the general population, they remain one of the more challenging dermatologic conditions to manage. More than a cosmetic nuisance, they are often symptomatic and can have a significant psychological burdun for the patient. Pulsed dye laser (PDL) has been used with variable degree of success in the treatment of hypertrophic scars and keloids. Most previous studies showed its use in patients with light skin types and the use of PDL in dark- skinned patients for the treatment of hypertrophic scars and keloids is not well established.
Materials and methods: 12 Iranian patient with hypertrophic scars and keloids were treated 2-8 times at 6-8 weeks intervals with a 595nm cryogen-cooled pulsed dye laser .All patients had Fitzpatrick skin types 3-5.We used 7 mm spot size at 1.5 -3 ms with 12-15 j/cm2 and 30 ms spray duration with 10 ms delay. Scars were evaluated for modified Vancouver scar scale (VSS) including: pigmentation, vascularity, pliability, height, pain and pruritus.
Results: Mean VSS before treatment was 8.50± 3.32 and mean VSS after treatment was 1.25±1.06. Difference in scaling before and after laser was 3-11, mean:7.25±2.96.
Wilcoxon test showed significant decrease (P=0.002) in before and after laser scaling.
Discussion: The cryogen-cooled 595 nm pulsed dye laser is a safe and effective option to improve the cosmetic appearance of hypertrophic scars and keloids even in patients with darker skin .

P26
LOW POWER VISIBLE AND NEAR IR LIGHT IIN EXPERIMENTAL ONCOLOGY

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Despite numerous attempts to elucidate character of effect of the low power visible and near IR radiations on tumor cells *in vitro* and on development of malignant tumors in experimental animals, the question remains open due to a great controversy of obtained data. In our opinion, a model the most adequate for solving this problem is implantation to animals of allogenic tumor cells. In this case, conditions are created for observation of the tumor growth from the moment of the appearance of tumor cells in the organism as well as for study of the character of the animal immune response to the light administration and survival of animals.
According to literature data, radiations of different wavelengths induce directly opposite effects: for instance, green and yellow laser light inhibit, whereas red laser light stimulate tumor growth. Therefore, we irradiated C3HA mice by the complete spectrum of the visible light (385-750 nm, 95% polarization, 40 mW/cm^2, 4.8 and 9.6 J/cm^2) for 5 days both before and after subcutaneous implantation to them of cells of allogenic hepatoma MH -22a. Taking into account the important role of immune system in development of neoplasms and the main contribution of its protective functions at the earliest stages of tumor growth, we implanted to animals a

comparatively small number of cells, two orders lower than other authors did. Preliminary data indicate that under these conditions of experiment and duration of observations for 30 days, the frequency of the developed tumors and their mean and maximal sizes decrease; in parallel, and mortality of the animals is reduced.

P27
LOW POWER VISIBLE AND NEAR IR LIGHT IN CLINICAL ONCOLOGY

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Although the low power visible (VIS) and near IR (nIR) light do not produce neoplastic transformation of tissue, attitude to phototherapeutic methods often turns out to be reserved due to apprehension of their stimulatory effect on tumor growth. The apprehension is based mainly on data of a possibility of an increase of proliferative activity of tumor cells after their exposure to light *in vitro*. In this work we used databases of Medline, Index Medicus, and Russian libraries to analyze results of application of the low power VIS and nIR light for the last 20 years in patients with oncological diseases. We found several tens of studies in which the low power VIS and nIR light was used successfully for prevention and treatment of complications caused by surgery (postoperational inflammatory complications), chemo- and radiation therapy (lesions of mucosae, early and late radiation skin reactions, immunosuppression, pain syndrome) in malignant tumors of head and neck, gastrointestinal tract, lung, female reproductive system, and skin. The phototherapy procedures included local action on damaged areas of skin and mucosae, including endoscopic methods, as well as intravenous laser blood irradiation. Alongside with the low power laser sources of VIS and nIR light, light emitting diodes (LED) were used. It is essential that in many studies, delayed follow-up results (after 2-5 years) were evaluated. No increase of frequency of tumor recurrence and metastases was noticed. Conclusion: the low power VIS and nIR light has been successfully used in complex treatment of oncological patients. Positive results of application of this kind of irradiation are due to its ability to stimulate the antitumor immunity and to produce anti-inflammatory, wound-healing, and analgesic effects, although it is necessary to carry out further experimental and clinical studies able to contribute to the more profound understanding of processes of interaction of the low power VIS and nIR light and tumor tissue, which in turn could help in substantiation of use the phototherapeutic application methods in clinical oncology.

LIGHT-TISSUE INTERACTION AND TISSUE OPTICAL PROPERTIES

P28
WHEN ISN'T IT NECESSARY TO DO DESBRIDMENT? BIOSPECKLE AS A DIAGNOSTIC TOOL FOR WOUND'S TREATMENT

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Laser presents a granulated pattern with dark and bright points at random activity into biological tissues were illuminated, known as Biospeckle allowing evaluate under chronic injury process. The movement of certain biological agents as the red blood cells in subcutaneous capillaries can show that this tissue is actually alive, and desbridment is unnecessary. The main aim of our study was to assess on mapping blood flow vessels under the subcutaneous tissue of patient lesions, which reveal the activity of the biological tissue, avoiding desbridment.
Preliminary assays on healthy volunteer and on chronic vascular ulcer's patients have been carried out. A CCD camera registered and recorded several numerical simulations, using different probabilities density functions to measure the velocities of scatters in order to supply subsidies for dynamic interpretation *in vivo* results post Low Level Laser Therapy (LLLT).
The obtained images revealed important differences in tissue action pre and post LLLT with a significant augment activity after Laser irradiation. The results showed that this technique allowed identifying and mapping the zone with variation flow in chronic sores avoiding needless desbridment.
Biospeckle made a clear distinction between zones with different tissue activity profiles, as a unique diagnosis tool for different lesions area that underwent to LLLT. This can monitor the evolution of chronic venous and diabetic ulcers, as a non invasive technique with cost-effectiveness to the patient, as well as to the Institutions.

P29
DETERMINATION OF OPTICAL PROPERTIES OF TISSUE AND OTHER BIO-MATERIALS

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Light propagation in tissue is at the core of redefining conventional medical therapies and diagnostic techniques. The current trend is in developing non-invasive medical techniques to promote the comfort for the patient. Non-invasive methods utilise some form of light either a laser, LED etc. and so the interaction between the tissue and these light sources is important. Determination of the optical properties of tissue are thus a fundamental instrument in refining the available as well as optimising new optically based methods and technologies in health care and life sciences.
These properties include the absorption and scattering coefficients of tissue and other materials. Knowledge of these properties assists in determining the dosage amounts required for treatment or diagnosis with minimal to no damage to the surrounding tissue. Although some of these properties do exist in literature, the composition of tissue varies and where possible it is preferred that these properties be measured, *in situ*.
For lab scale research, the gold standard for measurement of these properties is the Integrating Sphere. It requires *in vitro* samples in comparison to other instrumentation that can do both *in vivo* and *in vitro samples.* It does however offer the advantage of being cheap and easy to use. Furthermore it is applicable to a diverse range of biological and non-biological materials.
While the use of the instrument has been cited to a large extent in literature, it offers within the South African context a means to simultaneously measure the optical properties of different materials and model the behaviour of light within them. The creation of an intralipid-ink phantom calibration model has enabled the

extraction of some preliminary optical properties of thermo-responsive gels as well as tissue, using the polynomial regression method.[2]

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P30
EFFECTS OF IR LASER IRRADIATION AND PHOTO ABSORBING CREAM ON ENAMEL COMPONENTS: X-RAY FLUORESCENCE STUD

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Despite the significant decline in caries incidence in the last few decades in developed countries, dental caries is still reported as the single most common chronic childhood disease. White spot lesions correspond to the beginning of caries disease and are commo sub-clinical situation. Previous investigations have demonstrated increased enamel caries resistance after laser irradiation, by altering crystallinity, acid solubility, and permeability of enamel. Prevention has been investigated by various chemical and physical methods. The purpose of this in vitro study was to evaluate, by X-Ray Fluorescence (EDX), the effects of infra-red Diode laser treatment using a photo-absorbing agent on deciduous enamel mineral components, after irradiation and cariogenic challenge. Twenty four extracted or exfoliated molar teeth underwent soft tissue debridment and fluoride-free prophylaxis. Buccal surfaces were challenged using pH-cycling during 7 days in order to develop white spot lesions. Decayed teeth were divided into: (L/n=8) infra-red laser treatment (810nm, 100mW/cm^2, spot= 0.8 cm^2); IVL(Treatment 1/n=8) infra-red diode laser irradiation (810nm, 100mW/cm^2 ,spot=0.8cm^2) and photo-absorbing agent ; IV (Treatment 2/n=8) photo-absorbing agent alone; IVFL (Treatment 3/n=8) infra-red diode laser irradiation (810nm, 100mW/cm^2 ,spot=0.8cm^2) and fluorinated photo-absorbing agent and IVF (Treatment 4/n=8) fluorinated photo-absorbing agent alone. X-Ray Fluorescence (EDX 1300, Shimadzu) spectra were obtained to evaluate the calcium/phosphorus.
The measurements were performed with a count rate of 100 s per point (live time) and a dead time of 25 per cent. The energy range of scans was 0.0 - 40.0 eV. After that, samples were submitted to another 7 days cariogenic challenge using Ten Cate solutions and to the second X-Ray Fluorescence measuring. The obtained data indicated that in the laser plus photo absorbing cream group (treatment 1), the mineralization grade was preserved comparing with the initial moment, demonstrating decay resistance. The mineralization grade was preserved in laser or cream (both fluorinated and not) treatment even so depending on the individual variability. This individual dependence was not observed in laser and cream group.The IVFL group lost minerals as control group.

P31
BIOSPECKLE FROM BLOOD MICROCIRCULATION AND VESSEL DILATATION

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Objectives: The aim of this study was to evaluate the feasibility and the ability of dynamic light scattering (biospeckle) [1, 2] to visualize the blood microcirculation and vessel dilatation in living animals.
Background: Low Intensity Laser Therapy (LILT) can stimulate the cellular activity that induces the keratinocyte and mastocyte proliferations and angiogenese. These effects may improve wound healing due to the accute inflammation reduction. Vessel dilatation may result of these processes with an increased blood flow.
Methods: We illuminated the ear of hairless HRSJ mice with diode laser (650 nm, 5 mW). The scattered light was captured by a microscopy Jena Lumar (Carl Zeiss) (40x). The dynamic images (20 frames/s) were captured with a CCD camera(Andor), and processed and analised with ImageJ 1.36 software.
Results: Dynamic scattered images (Biospeckle) provided the relative bi-dimensional activity of blood flow. We observed differences in blood flow as a function of the physiological state of mice (normal, anaesthesied, and post-dead). In another animal, we cause a surface lesion in the vicinity of the monitored region. The vessel dilatation was estimated as 55% after 2 hours of the procedure.
Conclusion: Our results indicated that the Bispeckle can qualitatively monitor the blood microcirculation and vessel dilatation.

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P32
LETHAL PHOTOSENSITIZATION: CROMOPHORE USE EFFECT IN LIGHT SCATTERING ON HEALTHY AND CARIOUS HUMAN DENTINE

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Dental caries lethal photosensitization involves microorganism's treatment with photosensitizers and low level laser. Light and cromophore interaction promotes bacterial death and odontoblasts biomodulation. Laser effects in tissues are related with distributio of the deposited energy. It is necessary to understand light behavior as absorption, diffusion, transmission and scattering in mineralized tissue, using or no photosensitizers in order to dimension the comprehensive degree and effects in photodynamic therapy. Biological answer depends on light distribution, aim of this study and cromophore tissue concentration.

Healthy human teeth, with eroded enamel were distributed in: G1: Occlusal healthy surface (7) dentine was irradiated with InGaAlP laser (656.26 nm, 20 mW, fiber =6.51 mW) under magnifying stereoscopic lenses. G2: Samples of G1 had their occlusal surface immersed in metilene blue [50µg / ml], then, was irradiated with laser. G3: Occlusal surface (7) was submitted to pH cycling and carious dentine follows the same G1 protocol. G4: Samples of G3 had their occlusal surface immersed in metilene blue [50µg / ml], then, was irradiated with laser.

Scattering light images were captured; area was analyzed, demarcated and quantified in a computer system by one examiner. T student test demonstrated scattering area average of G2 (6.91mm^2) significantly smaller ($p = 0.01$) than G1 (13.62 mm^2). Observing carious tissue G4 presented scattering area average ($p = 0.01$) smaller (2.55 mm^2) than G3 (4.38 mm^2). Caries disease promotes tissue alteration affecting light scattering in dentine and photosensitizers use reduces light dispersal characterizing a superficial effect in lethal photosensitization.

MOLECULAR IMAGING & OPTICAL COHERENCE TOMOGRAPHY

P33
OPTICAL COHERENCE TOMOGRAPHY (OCT) – A REVIEW OF KEY TECHNOLOGICAL ADVANCES AND CLINICAL APPLICATIONS

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Optical coherence tomography (OCT), an interferometric technique that affords micron-scale resolution cross-sectional imaging of the subsurface microstructure of biological tissue in situ, is gaining acceptance in clinical applications both as a diagnostic aid, and a tool for health recovery monitoring. The technique offers great potential for clinical applications in terms of its high safety margin, cost and real-time imaging capacity.

In this paper we review the state of the art of optical coherence tomography (OCT). Following a discussion of the basic theory of OCT, an overview of the issues involved in the design of the main components of OCT systems is presented. To highlight key technological advances, differences in time-domain and wavelength-domain OCT configurations are discussed.

OCT applicability in dermatology is being explored. With a special focus on dermatology applications, new imaging modes and algorithms being developed to extract additional diagnostic information will be discussed.

Active research in OCT has been initiated by the Biophotonics Group, CSIR National Laser Centre. The paper concludes with a discussion of these activities at the CSIR to include a discussion of OCT role in laser-based therapy procedures.

PAIN MANAGEMENT

P34
INFRARED LASER IRRADIATION APPLIED TO THE TREATMENT OF BURNING MOUTH SYNDROME

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Burning mouth syndrome (BMS) is a chronic disease that causes a burning sensation on an otherwise clinically normal oral mucosa. Its pathogenesis is still unknown and, as consequence, there is no satisfactory treatment so far.
The aim of this study was to investigate the effect of low level laser therapy on the reduction of patient's burning symptom.
Seven patients affected by burning sensation were selected at the Clinic of Oral Diagnosis of the Dentistry School at the University of São Paulo. The protocol was reviewed and approved by the local ethics committee. An AsGaAl diode laser (Quantum, EccoFibras, Campinas, Brazil) emitting 790nm was used in this study. The time of irradiation was calculated based on the fluence of 6J/cm^2, output power of 120mW and area to be treated. Energy was delivered by scanning the mucosal surface keeping the probe in contact with the tissue. The treatment was performed once a week for three consecutive weeks. Burning intensity was recorded through a visual analog scale (VAS) before, at the end of the treatment and in a 6-week follow-up.
The mean VAS value decreased significantly from the beginning to the end of laser therapy ($p=0.003$) and to the follow-up ($p=0.017$). After the laser irradiation, a mean reduction of 80.3% was obtained. There was no statistical difference between the end of the treatment and the 6-week follow-up ($p=0.25$).
Under the investigated parameters, infrared low level laser therapy was effective in the reduction of the BMS symptoms and it was able to maintain the improvement achieved for 6 weeks.

P35
CONFIRMATION: LASER APPLICATION TO THE CERVICAL SPINE IN THE ABSENCE OF PATHOLOGY HAS NO EFFECT ON SYMPATHETIC NERVOUS SYSTEM OUTFLOW

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Background: The mechanism to account for the hypoalgesia reported following low level laser therapy (LLLT) irradiation remains unclear. To verify response mechanisms and the feasibility of clinical models of pain research, the effect of laser on neurophysiological pain mechanisms needs to be determined first in the absence of pathology.
Method: A randomized, placebo-controlled, double-blind, repeated measures study was undertaken to investigate the possible involvement of the sympathetic nervous system (SNS) following laser irradiation. Nineteen healthy subjects participated in a study that consisted of five treatments to the right posterior neck region at a dose of 4.0J/cm^2, using an infrared laser (820nm). Each subject received active laser stimulation, placebo laser and a control condition over a three-day period, with a minimum of one day between sessions. Heart rate (HR), blood pressure (BP), bilateral skin temperature (ST) and skin conductance (SC) were measured distally.

Results: Results indicated that there was no significant alteration in sympathetic outflow, with no change in any of the variables (BP, HR, right and left ST or right and left SC). It was concluded that in the LLLT treatment strategy used in this study, no effect on SNS outflow occurs in normal subjects.
Conclusion: Given that the resultant sympathetic response to laser therapy in a clinical pain model has not yet been investigated, the described model raises the prospect for continuing research in this area. Further research needs to be carried out in clinical models of pain to determine if the SNS is involved in pain mediation subsequent to laser irradiation.

PHOTODYNAMIC THERAPY

P36
INFLUENCE OF THE DYE SOLVENT ON THE PHOTODYNAMIC ANTIMICROBIAL EFFECT OF PHENOTHIAZINIC DYES

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Photodynamic antimicrobial therapy (PAT) may become an useful clinical tool to treat microbial infections, overcoming microbial resistance that is a major problem nowadays regarding infectious disease. Few clinical or clinical oriented studies in PAT are currently available and *in vitro* studies present a noteworthy variance on the used parameters.
The aim of this study is to evaluate the role of the dye solvent regarding dimerization process, and photodynamic efficiency. Methylene Blue (MB) and Orto-Toluidine Blue (TBO) were evaluated in concentrations ranging from 5μM to 3mM in two different solvents: deionized water and saline solution, through optical absorption spectroscopy and fluorescence emission spectroscopy. The tested solvents were analyzed via dissolved oxygen availability, and also the singlet oxygen emission at λ=1270nm was evaluated in the same dye concentration. Microbiological evaluations were performed in cultures of *Escherichia coli* on stationary phase to verify the solvent influence on the two photosensitizers in concentrations of 30μM.
The results show that the ratio of monomer/dimer for TBO and MB in saline solution is smaller than in water. The singlet oxygen emission from a MB solution presented a higher signal in water than in saline. The microbiological analyses demonstrated an increased lethal photosensitization for dyes in water.
These results indicated the importance of the studied parameter, the influence of the solvent on the final result and the importance of the monomer/dimer ratio on the dye photochemistry, therefore to design a clinical oriented study these parameters must be taking into account.

P37
METHOD OF FLUORESCENCE SPECTROSCOPY IN THE MONITORING OF EYELIDS BASAL CELL CARCINOMA PDT

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Introduction: The rate of the basal cell carcinoma (BSC) among the malignant forms of eyelids skin tumors reaches 84%. PDT is one of the best ways of treatment because of its advantages such as noninvasiveness, high cosmetic effect and high selectivity.
Purpose: To assess opportunities of fluorescence spectroscopy method in the evaluation of PDT effectiveness in eyelids basal cell carcinoma treatment.
Methods: The total number of patients was 36 (15 with nodal form of BSC, 21 with ulcerous form of BSC). We used Russian photosensitizer Photosens (producer SSC "NIOPIK" Moscow, Russia.) in doses 0,2mg\kg (12 patients) and 0,3mg\kg (24 patients). All patients got 2 sessions of PDT. Photosensitizer accumulation was estimated, using laser fluorescent spectrometer LESA "Biospec" Ltd., Moscow Russia, (λext 632.8nm).

Results: We found 2-3sm zone of ischemia around the tumor in 24-48 hours after PDT sessions. We found straight correlation between the dose of Photosens and effectiveness of PDT.
Conclusions: The minimal dose of Photosens for effective PDT on eyelids basal cell carcinoma is 0,3mg\kg dose. We can assess effect of PDT not only by clinical presentation but the level of photosensitizer accumulation, estimated by laser fluorescent spectrometer.

P38
INTRAOPERATIVE PDT OF MALIGNANT TUMORS WITH INTRAVENOUS AND INTRA-ARTERIAL INJECTION OF PHOTOSENSITER PHOTOSENS

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Introduction: The first clinical trials of intraoperative photodynamic therapy (IPDT) of cancer with domestic photosensitizing drug Photosens (sulphonated Al-phthalocyanine) have been started in P.A. Hertzen Research Oncologic Institute in 1998 under guidance of V. Sokolov. The practical application of IPDT in Moscow Oncological Hospital N62 was started in 2000.
Materials & Methods: This report presents the results of treatment using IPDT with Photosens.of 135 patients with advanced primary, recurrent malignant tumors of skin and soft tissue, head and neck during the period from 2000 to 2007. Photosens was injected intravenously in the dose of 0.2-0.5 mg/kg of body weight 1-3 or 24 hours prior to the surgical operation, or intra-arterially in the dose of 2-4 ml (0.2% solution) immediately prior to the operation. During IPDT the fluorescence spectroscopy monitoring of Photosens concentration in malignant and normal tissues was carried out. The density of irradiation power for IPDT sessions was normally from 10 to 50 J/cm^2.
Results & Conclusions: No complications were noticed in all of the treated patients during their post-operative period. In group of the patients with malignant tumors of head and neck with intra-arterial injection of Photosens local recurrence was detected only in 25% cases. Maximal observation period without local recurrence was 6 years. IPDT as compared with radiation and chemotherapy differs by the best tolerance and absence of side effects.

P39
CHANGES IN ULTRASOUND DOPPLER IMAGING OF OCULAR BLOOD FLOW IN CENTRAL CHOROIDAL NEOVASCULARISATION TREATMENT

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Purpose: To study the changes in ocular blood flow in case of choroidal neovascularisation and after the photodynamic treatment (PDT).
Method: The total number of patients was 41 (49 eyes). All the patients were treated with 2 sessions of photodynamic therapy with Photosens (0.2% solution of mixture sulfonated aluminium phthalocyanine 0,05 mg/kg, intravenously, producer SSC “NIOPIK”, Moscow). A diode laser («Biospec», Inc, Moscow) was used operating in the range of 675 nm. We compared changes in ocular blood flow using modern methods of ultrasound diagnostics with the help of system “VOLUSON 730 Pro” (“Kretz”) linear probe SP 10-16 Hz and volume probe 10-16 Hz. We determined blood flow in the central retinal artery (CRA), central retinal vein

(CRV) and ophthalmic artery (OA). To establish the changes in ocular blood flow we compared systolic velocity (V_{max}), diastolic velocity (V_{diast}) and resistance index (RI) before and after the treatment.
Result: Before the PDT we determined diminution of velocity dates especially V_{diast} predominantly in the CRA, less significant – in the OA. RI was increased in all investigated vessels. Blood flow in the CRV was also increased. This complex of pathological changes of the ocular blood flow indicate to ischemic component in choroidal neovascularisation development. We determined statistically significant improvement of ocular hemodynamics after the PDT especially in the CRA. Blood flow in the CRV was decreased after the PDT.
Conclusion: Modern methods ultrasound diagnostics of the ocular blood flow give about ocular hemodynamics in case of choroidal neovascularisation.

P40
MECHANISM OF ACTION OF CELL DEATH INDUCTION USING A METALLATED SULPHOPHTHALOCYANINE PHOTOSENSITIZER IN COLORECTAL CANCER

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Background: Photodynamic therapy (PDT) is a minimally invasive therapeutic modality which has been approved for the clinical treatment of several types of cancer and non-oncological disorders (Juarranz et al., 2008). It involves the administration of a photosensitizing agent which selectively accumulates in the target cells followed by local irradiation with visible light (Lukšienė, 2003). This causes selective damage to target tissue (Brown et al., 2004) and cell death. The mode of cell death induced by PDT is of great interest since it influences the response of the immune system and therefore the effectiveness of the treatment (Plaetzer et al., 2003). Aim: The aim of this project is to investigate the mechanism of action of cell death induction by a second generation photosensitizer (PS), a metallated sulphophthalocyanine, and comparing it to that of an established (porphorin) PS used in the treatment of colorectal cancer. Methods: The mechanism of action of cell death induction will be elucidated using techniques including flow cytometry (apoptosis and necrosis), fluorescence microscopy (reactive oxygen species), real-time polymerase chain reaction and live cell imaging (gene expression) and various biochemical assays (activation of caspases). Results: The results from this study will give further insight into the efficacy of using a metallated sulphophthalocyanine in the treatment of colorectal cancer.
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P41
EXPERIMENTAL STUDY OF ANTITUMOR EFFICACY OF NOVEL PHOTOSENS-BASED PDT METHODS

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Photodynamic therapy (PDT) is now successfully used for treatment of several malignancies.

The purpose of this study was to evaluate antitumor efficacy of Photosens-based PDT with low- intensive irradiation and to determine the degree of tumor tissue oxygenation during the procedure.

Low-intensity (from 12 mW/cm^2 to 25 mW/cm^2) irradiation regimen in Photosens-based PDT is less aggressive than high-intensity (standard) one while oxygen expenditure in S-37 murine sarcoma tissue is more rational.

The increase in Photosens-based PDT efficacy in S-37-bearing mice was observed when the power density of laser irradiation was decreased from 100 mW/cm^2 to 12 mW/cm^2. Maximum therapeutic effects were observed under the following low-intensity irradiation regimen: Photosens (5 mg/kg b.w. therapeutic dose), 24 h → irradiation (12 mW/cm^2 power density, 90 J/cm^2 energy density). Total tumor resorption was observed in 34% of animals. But that regimen turned to be toxic for animals and caused their death. The decrease in Photosens dose down to 1.25 mg/kg as along with the decrease in light dose to 45 J/cm^2 (Photosens -1.25 mg/kg b.w., 24 h → PDT -12 mW/cm^2, 45 J/cm^2) resulted in the decrease of treatment toxicity without affecting high therapeutic efficacy of the method. At the same time, tumor growth inhibition was less than 59±5% under standard (high-intensity) irradiation regimen (5 mg/kg b.w. Photosens dose, 100 mW/cm^2 power density, 90 or 45 J/cm^2 energy density).

Thus, the low-intensity irradiation regimen used for Photosens-based PDT makes it possible to increase therapeutic efficacy of the method and at the same time to decrease the photosensitizer dose.

PHYSIOTHERAPY, RHEUMATOLOGY AND LASER ACUPUNCTURE

P42
THE EFFECTS OF 830NM AND 650NM CONTINUOUS WAVE LASER IRRADIATION ON RAT DORSAL ROOT GANGLION NEURONS: RELEVANCE TO NEURAL MECHANISMS OF CLINICAL PAIN RELIEF IN ACUTE AND CHRONIC PAIN

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Background: Neural inhibition has been hypothesised as a mechanism for pain relief with low level laser therapy for acute and chronic pain. Underpinning this effect based on our previous study is evidence that 830nm, cw, laser irradiation (LI) caused varicosity formation, disruption to fast axonal flow, decreased mitochondrial membrane potential (MMP) and decreased ATP within axons of cultured rat dorsal root ganglion (DRG) neurons [1]. In our current study we explore the effects of single and repeated exposures of 830nm and 650nm LI, to further understand mechanisms of neural inhibition.
Materials and Methods: We irradiated cultured rat DRG neurons with single exposures of 830 and 650 nm, cw, LI which were repeated at 24 hours. We observed morphological changes in rat DRG neurons using immunohistochemistry at 1, 4 and 25 hours post-LI. Control cultures which were not laser-irradiated but fixed and stained in the same manner as LI-exposed neurons were observed at the same time intervals. Confocal microscopy was used to image real-time changes in MMP for several time exposures of 830nm and 650nm, cw, LI.
Results: We report findings which include varicosity formation in the axons irradiated with 830nm LI which was associated with decreased MMP. Changes with 650nm laser will also be reported
Conclusion: The morphological changes observed represent disruption to fast-axonal flow and decreased MMP and ATP with 830nm LI. These effects provide a mechanism for the pleiomorphic inhibitory effects of LI which may contribute to the analgesic effects of low-level laser therapy.

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P43
EFFECTIVE MECHANISM AND PRACTICE OF LOW LEVEL LASER ACUPUNCTURE

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Purpose To explore Laser Acupuncture (LA), combination between bio-stimulation of the low level laser and the treatment of traditional acupuncture, and further to develop the traditional acupuncture in advanced manner of high technology for varieties of medical practice.
Materials and Methods The active mechanism and clinical application of LA are studied on the basis of the properties of low level laser photo-physics, photo-chemistry, photo-biology and bio-stimulation as well as the real effect of LA and its physiotherapy on multi-levels of molecules, cells and tissue-organ systems. Meanwhile, the future of LA is also prospected. These items include (1) Optical characteristics of low level laser and LA in physics, chemistry and biology, (2) Effective mechanism and clinical application of LA in various degrees of molecular, cellular and organ-systemic levels. (3) Case treatment of LA at analgesia, anti-additions, anti-allergy,

anti-asthma, healing of skin wound-ulcer, therapy of angio-neuropathy, delaying aging, psycho-neurological relief, physiological transferring in sports medicine, diet of losing weight, skin cosmetology, etc. (4) The future development of LA.
Results A myriad of clinical and experimental evidences demonstrate that the merger between both point-stimulation of acupuncture and bio-stimulation of low level laser founds on the clinical effect of LA on various conditions. It is a highly efficient, safe, and painless way.
Conclusion LA has such a trait of no side-effect, non-pain, pan-application in clinics, high acceptance of patients and highly effective treatment at many traumas that most of medical disciplines are admitted into its treatment at any disorders in the world, but much more work needs to be done before all health-related problems are administered with LA for a goal of medical therapy.

P44

EFFECT OF 830 NM LOW LEVEL LASER THERAPY (LLLT) IN EXERCISE-INDUCED SKELETAL MUSCLE FATIGUE IN HUMANS

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Objective: To investigate if skeletal muscle fatigue development during repeated voluntary biceps humeri contractions could be attenuated by Low Level Laser Therapy (LLLT).
Background Data: Previous animal studies have indicated that LLLT can reduce oxidative stress and delay the onset of skeletal muscle fatigue.
Methods: Twelve male professional volleyball players entered a randomized double-blinded placebo-controlled trial, in two sessions (day 1 and day 8) with a one-week interval, both groups performed as many voluntary biceps humeri contractions as possible, with a load of 75% of the maximal voluntary contraction force (MVC). At the second session on day 8, groups were either given LLLT (λ = 655 nm) with 5 Joules at an energy density of 500 J/cm^2 administered in each of four points along the middle of the biceps muscle belly, or placebo LLLT in the same manner immediately before the exercise session. The number of muscle contractions above 75% of MVC was counted by a blinded observer and blood lactate concentration was measured.
Results: Compared to the first session (day 1), the mean number of repetitions increased significantly by 8.5 repetitions (+/- 1.9) in the active LLLT group at the second session (day 8), while in the placebo LLLT group the increase was only 2.7 repetitions (+/- 2.9) (p=0.0001). At the second session (day 8), blood lactate levels increased from a pre-exercise mean of 2.4 mmol/l (+/- 0.5), to 3.6 mmol/l (+/- 0.5) in the placebo group and to 3.8 mmol/l (+/- 0.4) in the active LLLT group after exercise, but this difference between groups was not statistically significant.
Conclusion: We conclude that LLLT seems to delay the perceived onset of muscle fatigue and exhaustion by local mechanisms in spite of increased blood lactate levels.

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EFFECT OF 830 NM LOW LEVEL LASER THERAPY (LLLT) IN SKELETAL MUSCLE RECOVERY AFTER HIGH INTENSITY EXERCISE IN ATHLETES

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Objective: To investigate if the 830 nm Low Level Laser Therapy (LLLT) applied before the exercise could accelerate skeletal muscle recovery after high intensity exercises.
Methods: Twenty athletes (nine male professional volleyball players and eleven male young football players) entered a cross-over randomized double-blinded placebo-controlled trial, in two sessions with a one-week interval. All subjects performed the Wingate test, with a load of 7.5% of their body weight. Before the exercise test the subjects were randomly allocated to receive active LLLT or placebo LLLT treatment. Active LLLT (830 nm wavelength, 100 mW output, spot size 0.0028 cm^2) or an identical placebo LLLT was delivered to five points in rectus femoralis humeri muscle (bilaterally). The Wingate test was monitored by a blinded observer for both athletes (volleyball and football), and the blood lactate concentration was measured before and at 3, 10 and 15 minutes after exercise tests for the football athletes. Creatine kinase (CK), is a plasma enzyme and a precursor for development of muscle damage, and CK levels were measured before and 3 minutes after the exercise test in the volleyball athletes.
Results: There were no significant differences in the results of the Wingate test between the treatments (active LLLT or placebo LLLT) or the athlete groups (volleyball or football). For the football athletes the change in blood lactate levels at 15 minutes post-exercise was significantly lower (p=0.0093) in the active LLLT (8.55 $mmol.L^{-1}$ +/- 2.14) compared with placebo LLLT (10.52 $mmol.L^{-1}$ +/- 1.82). Post-exercise CK levels for the volleyball athletes were significantly lower (p=0.0133) in the active LLLT group (2.52 $U.L^{-1}$ +/- 7.04) compared with the placebo LLLT group (28.49 $U.L^{-1}$ +/- 22.62).
Conclusion: We conclude that 830 nm LLLT seems to accelerate skeletal muscle recovery in athletes, possibly by mechanisms of decrease the muscle damage and increasing the blood lactate removal after high intensity exercises.

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LOW LEVEL LASER THERAPY STIMULATES EXPRESSION OF GENES RELATED TO OSTEOBLAST DIFFERENTIATION DURING RAT TIBIAL BONE CONSOLIDATION

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Although bone tissue possesses the capacity for regenerative remodeling, this process is often impaired in many clinical situations, resulting in non-union and delayed bone healing. With the aim of reducing the

substantial incapacity associated with bone fractures, many interventions have been studied, including the low level laser therapy (LLLT). Some studies have shown that LLLT is efficient to accelerate fracture consolidation. In spite of a series of radiographic and biomechanic evidences of the osteogenic effects of LLLT, the cellular and molecular mechanisms by which this treatment acts on bone consolidation are not fully understood. The aim of this study was to investigate the effects of LLLT on alkaline phosfatase (ALP), bone morphogenetic protein 4 (BMP-4) and osteocalcin (OC) gene synthesis, during bone consolidation in tibial defects in rats, in 2 different periods of time. *Methods:* Sixty male Wistar rats were divided into 3 groups: standard control group, control bone defect group and bone defect laser treated group (GaAlAs laser, 830 nm, 30 mW, 50 J/cm2). All groups were divided in 2 sub-groups (n=10 animals): group A (3 sessions of treatment) and group B (6 sessions of treatment). Rats were euthanized and tibias were defleshed and prepared for Real Time- PCR gene synthesis evaluation.
Results: After 3 sessions of laser irradiation, there was an increase in the synthesis of ALP and BMP-4 genes in the treated group compared to the controls ($p \leq 0,05$). No difference was found in the OC gene synthesis. At the session 6, it was observed no difference between ALP gene synthesis among groups. Interestingly, an increased BMP-4 and OC gene synthesis in the irradiated group was demonstrated.
Conclusions: Our results suggest that 830 nm laser may have a positive effect on the synthesis of genes related to osteoblasts differentiation, determining an increase in cell maturation and an acceleration of bone consolidation.
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PLASTIC SURGERY, OTOLARYNGOLOGY & ORTHOPAEDICS

P47
LOW LEVEL LASER THERAPY IMPROVES BONE REPAIR IN RATS TREATED WITH ANTI-INFLAMMATORY DRUGS

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Nowadays, selective cyclooxygenase-2 non-steroidal anti-inflammatory drugs have been largely used in surgical practice for reducing edema and pain. However, the association between these drugs and laser therapy are not known up to now. Herein, the aim of this study was to evaluate the action of anti-COX-2 selective drug (celecoxib) on bone repair associated with laser therapy. A total of 64 rats underwent surgical bone defects in their tibias, being randomly distributed into four groups: Group 1) negative control; Group 2) animals treated with celecoxib; Group 3) animals treated with low level power laser and Group 4) animals treated with celecoxib and low level power laser. The animals were killed after 48 hours, 7, 14, and 21 days. The tibias were removed for morphological, morphometric, and immunohistochemistry analysis for COX-2. Statistical significant differences ($p<0.05$) were observed in the quality of bone repair and quantity of formed bone between groups at 14 days after surgery for groups 3 and 4. COX-2 immunoreactivity was more intense in bone cells for intermediate periods evaluated in the laser exposed groups. Taken together, such results suggest that low level laser therapy is able to improve bone repair in the tibia of rats as a result of an up-regulation for cyclooxygenase-2 expression in bone cells, even when anti-COX-2 is administrated during surgical procedure.

P48
THE EFFECTS OF BIOSILICATE® AND LOW LEVEL LASER THERAPY ON TIBIAL BONE CONSOLIDATION IN OSTEOPENIC RATS

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Million of fractures occur every year worldwide due to a reduced bone mass related to osteoporosis. Many of them termed in non-union fratures. In this context, a lot of methods for treating delayed and non-union fractures have been investigated including biomateriais and low level laser therapy (LLLT). Some studies have shown that both treatments are able to stimulate the osteogenesis of bone tissue. Therefore, the aim of this study was to investigate the effects of the Biosilicate® and the 830nm laser on tibial bone consolidation in osteopenic rats.
Methodology: It was used 50 female osteopenic rats, divided into 5 groups: standard control (SC), osteopenic fractured control (OC); osteopenic fractured treated with Biosilicate® (FBio), osteopenic fractured treated with laser (OL); osteopenic fractured treated with Biosilicate® and laser (OFLBio). Biosilicate® is an osteogenic biomaterial and it was carefully put in the cavities. We used a GaAlAs laser, 830 nm, 100 mW, 120 J/cm^2. The laser treatment was performed during 12 sessions. On day 14 after the surgery, the animals were euthanasied and the right tibias were defleshed and prepared for a biomechanical test (maximum load: ML). Results: The mean ML showed by the control fractured group was statistically significant lower compared to the other groups. Fractured animals treated with laser presented higher values of ML compared to the fractured controls but the mean ML was lower compared to SC. Animais treated with Biosilicate® showed higher values of ML compared to the SC group. Interestingly, animals treated with the associated treatments (group OFLBio) showed the higher values in the biomechanical analysis. The ML of this group was statistically higher than all other groups.
Conclusion: LLLT and Biosilicate® were effective to improve callus bone strenght of tibial deffects in osteopenic rats. However, the best results were demonstrated by the animals treated with both treatments. The results of this work may suggest that the association of osteogenic biomaterials and LLLT is efficient to accelerate bone consolidation and to increase callus strength in osteopenic rats.

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BODY CONTOURING BY LOW POWER LASERS

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Body contour has important role in medical aesthetics. A great many people, particularly female, suffer from unwanted shape of body curves which is usually because of aging, obesity, sedentary life and constitutional. There is no doubt that dietary regimen and regular exercise are very effective but some times achieving a desirable body contour needs some surgical intervention (such as liposuction or surgery). Surgical interventions have some risks and side effects (either probable or inevitable) such as risks of anesthesia, undesirable scar, fat emboli (which can be fatal) and etc.
We used low power lasers on a great many cases for body contouring with different purposes:
1) Decreasing anteroposterior diameter of abdomen (bulginess of abdomen)
2) Decreasing bulginess of flanks
Both of presented procedures lead to decreasing circumferences of abdomen.
3) Decreasing bulginess and circumference of buttock.
4) Decreasing bulginess on the trocanters.
5) Decreasing circumferences of thighs and arms.
6) Decreasing bulginess on the back (due to abnormal fat deposition).
7) Decreasing volume of breasts some times together with breast lifting.
8) Skin tightening due to weight loss or aging.
9) Treatment of cellulite which can be pathologic although it is considered an aesthetic problem by people.
Because of some hormonal affects fat tissue in women contains significant amount of water and lymph (up to 70%) therefore drainage of excessive water and lymph from the area ends to an acceptable reduction in size. This is the reason why LLLT for body contouring has better results on women in comparison with men.
The clients with moderate problem are the most satisfied. In mild cases, changes are not obvious and the client see no change and in sever cases at the end of protocol the client is over size although many centimeters of circumference is decreased.
Statistics will be presented.
We had 1-12 centimeters decrease in circumferences of different areas of body.
We used GaAs laser, 4 J/Cm2, 6-20 points of irradiation (based on surface of area), 10-15 sessions (3 sessions per week).
Before any procedure history and physical exam is necessary to R/O underlying diseases such hypothyroidism and etc.
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P50

CAPILLARY MALFORMATIONS: PRELIMINARY RESULTS OF TREATMENT ASSOCIATING ND:YAG 1064 NM LASER AND INTENSE PULSED LIGHT

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Congenital vascular malformations up to know, have their best results with dye laser, based on selective photothermolysis principle, although limited penetration of this laser makes it difficult to reach deeper lesions. Recently intense pulsed light has been used isolated with promising results. We associate, in a single equipment, long pulse Nd:Yag 1064 nm laser and Intense Pulsed Light, for simultaneous treatment of the superficial and deep vascular lesions.
Seventeen patients, five male and twelve female with a mean age of 30.1 years, were treated with the association described in an office basis with topical anesthesia only at monthly intervals. All treatments were carried out by the same surgeon. The equipment utilized was the Synchro Platform (DEKA) with a 4mm diameter spot size and fluence of 110J/cm^2 for the ND:Yag 1064nm laser. For the Intense Pulsed Light was utilized a 550nm cutoff filter with a 46x10mm spot size and 21 J/cm^2 as fluence, divided in two shots Results were evaluated through clinical and photographical analysis together with the patient. A subjective quantification of the clearing of the treated area in relation with the pretreatment status was carried out classifying the results in excellent, good, regular and insufficient.
In seventeen patients treated four results were excellent, nine were good, four results regular and none insufficient. Two patients presented hipertrofic scaring and two hypo pigmentation as complications of the treatment.
The treatment can adequately be done in an office basis with topical anesthesia in most cases. Association of the two different technologies got a satisfactory result in treating deeper planes and it is probably one more technique for treating such lesions. This study proceeds and more patients and follow up length will be added in near future.

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LASER INDUCED SHOCKWAVE LITHOTRIPSY IN UROLOGY AND ENT

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Different clinically available pulsed laser systems emitting either in the IR- or VIS- spectral region were compared with respect to their impact on phantom stones and clinical calculi in a standardized manner. Furthermore the impact of laser radiation on the medical equipment was instigated.
Light of the pulsed laser systems emitting IR- (λ=2100nm: Ho:YAG-laser) or VIS- (λ=532nm/1064nm: FREDDY®-laser; 598nm: FLPD-laser) light were used. The ablation threshold as well as the fragmentation rate and the sputtering rate of artificial and human calculi (urologic and salivary) of different compositions were measured and different fragmentation rates in relation to the fluence were calculated. In the same manner different equipment devices were tested. In order to underline the different primary laser induced processes that lead to fragmentation the generated shockwave pressures of the different laser devices were measured.
The ablation threshold value of IR-lasers was overstepped by the lowest laser setting independent to repetition rate and fibre diameter. There was no difference in the fragmentation and sputtering rate between different IR-lasers neither for stone phantoms nor for clinical stones. On stone phantoms VIS-lasers showed a 20 times higher fragmentation rate and a 10 times higher sputtering rate than the IR-lasers. All kinds of clinical calculi could be destroyed IR-lasers in contrast to using VIS-lasers. Equipment destruction could be induced by each laser.
Investigations on phantom stone fragmentation are useful to compare clinical laser parameter settings but can partially be transferred to clinical stone fragmentation. IR-lasers can induce ablation and fragmentation to all examined human calculi at lowest energy settings in contrast to VIS-lasers which could not induce ablation on some stone composites. The VIS-lasers are solely useful for laser induced shock wave lithotripsy while the IR-lasers are in use for other clinical applications (e.g. coagulation, ablation).

P52
LED THERAPY IN CHEMOTHERAPY-INDUCED MUCOSITIS

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Mucositis is the most common oral complication of cancer chemotherapy that causes pain and impairs patient's ability to eat, swallow and may determine interruption of the treatment. The aim of this study was to evaluate the effect of LED (Light Emitting Diode) therapy on chemotherapy-induced mucositis in hamsters. The animals of both experimental (G1) and positive control group (G2) received intraperitoneal injections of 5-fluorouracil on days 0 and 2. All animals had right and left oral mucosa irritated by superficial scratching on days 3 and 4. The G1 received LED irradiation (630 nm, 160 mW, 12 J/cm2) during 37,5 seconds at days 3, 4, 6, 8, 10, 12 and 14. The cheek pouches were everted and photographed from day 4 until 14 at 2-day intervals. Photographs were randomly scored according to the severity of induced mucositis (0 to 5). The G2 received no treatment. The negative control group (G3) received no mucositis induction. The cheek pouches of 8 animals (G1 and G2) were dissected for histopathological examination on days 5, 9, 13 and 15. The statistical analysis showed significant differences between treated and non-treated groups ($p<0,05$), although histopathological findings have demonstrated muscular degeneration in 18% of the sample (G1), approximately. These results pointed out that LED therapy protocol established for this study was effective to reduce the severity of oral mucositis and accelerated the healing process, although it has not completely prevented the appearance of oral lesions.

P53
LOW LEVEL LASER THERAPY IS MORE EFFECTIVE THAN ULTRA-SOUND TO ACCELERATE BONE CONSOLIDATION IN RATS

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Million of fractures occur every year worldwide and many of them termed in non-union fractures. A lot of methods for treating delayed and non-union fractures have been investigated and promising treatments are the use of ultra-sound (US) and low level laser therapy (LLLT). Some studies have shown that US and LLLT are able to stimulate the osteogenesis of bone tissue. However, a comparison of them is rare. The aim of this study was to investigate and to compare the effects of US and LLLT on bone consolidation of induced tibial defects in rats, in 2 different periods of time. *Methods:* Eighty male Wistar rats were divided into 4 groups: standard control group, control bone defect group, bone defect treated with US (1.5 MHz, 30 mW/cm^2) group and bone defect treated with LLLT group (GaAlAs laser, 830 nm, 30 mW, 50 J/ cm^2). All groups were divided in 2 sub-groups (n=10 animals): group A (3 sessions of treatment) and group B (6 sessions of treatment). The animals were euthanized 24 hours after the last session of treatment. The tibias were defleshed and prepared for morphological and morphometric histological analysis. *Results:* After 3 sessions of treatment, a significant increase was observed in the area of neoformed trabeculae in the tibial defects of the US and LLLT exposed groups compared to the controls ($p\leq0,05$). Also, the treated groups showed a decrease in the inflammation signals. After 6 sessions, the callus organization and the quality of bone repair presented by the laser treated group was higher than those presented by the US group and controls ($p\leq0,05$). These results show that both devices are able to accelerate bone consolidation. However, in a second phase of bone regeneration, the laser was more efficient to stimulate the growth of the trabecular area and the quantity of neoformed bone.

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P54
COMBINED WAVELENGTHS OF LOW LEVEL LASERS, AN EFFECTIVE APPROACH IN SCAR HEALING

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Generally, fibrosis and scar formation represent an imbalance between deposition of collagen and its breakdown, resulting in unwanted accumulation of collagen. This leads to a broad spectrum of tissue disturbances ranging from local scarring to completely shutting down internal organs. Some scars are difficult to treat because of their tendency to worsen with hypertrophy and contracture (i.e. burn scars). In this study, we have investigated the effects of various low level lasers producing flat-top beams, individually and in combination, for treatments of scars.
Twenty four patients were treated with a 130mW 665nm, 130 mw 780 nm, and 130 mw 905 nm Softlaser three times per week over 8 weeks. In each patient a control area was defined, which was not irradiated. Parameters such as Vancouver Scar Scale (VSS) and the Visual Analogue Scale (VAS) for pain have been considered. Photographical and clinical assessments have been recorded in all the patients. In 95% of cases an improvement after treatment could be seen. For combined beams, a 60% decrease in VSS parameter in the treated areas were achieved compared with 30% decrease for 665 nm, 23% for 780 nm and 18% for 905nm beam individually. However, in all illuminated cases the results have been much better compared with the control area.

P55
THE LASER THERAPY ON TREATMENT OF BELL FACE PARALYSIS: CLINICAL CASE

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The Bell´s palsy is a unilateral and benign facial paralysis of sudden beginning and unknown cause. It affects the infra-weather portion of the facial nerve with loss of the contract function of the muscle mimic of the face, causing damages in the face expression (essential to no verbal communication). It can have temporary character or remain of definitive form. It is characterized for presenting the Bell phenomenon (eye movements for top and outside when the patient tries to

close the eyes), face and/or retroarticular pain. It can affect the salivation, the tasting and the lacrimation, depending on the topography arrives of the facial nerve. The lasertherapy has demonstrated positive effect in the restoration of face movements, reducing the time of the paralysis. The objective of this work was to evaluate the effectiveness of the laser therapy in carrying treated in the Center of Laser of the FOUFPE. This study verifies clinically the efficiency of the lasertherapy in the treatment of the facial paralysis of Bell.

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COMPARATIVE CLINICAL STUDY OF TEMPOROMANDIBULAR JOINT DYSFUNCTION (TMJ) USING RED AND INFRARED LED-THERAPY

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The low intensity laser therapy has been widely applied in pain relief or analgesia mechanism considering several clinical situations. With the advent of new LED-based (light emitting diode) light sources, the need of further clinical experiments aiming to compare the effectiveness among them is paramount. The LED system therapeutic use can be denominated as LEDT – Light Emitting Diode Therapy. This study proposes an evaluation of antialgic effect to TMJs internal disorders using two different sources of light emitting diodes (LEDs), one emitting at the spectral band of red (630 +/- 5 nm) and the other one at infrared band (880 +/- 5 nm), comparatively to a control group (780nm lasertherapy using 105,7 J/cm2). Mandibular oral aperture and pain sintomatology are being considered using appropriate equipment developed to do it. Power out put is 150mW, tip area is 0.38cm² for both sources. Fluency or dose chosen is 24 J/cm² for each point of application, around the TMJs, from both sides. Five points are irradiated: three around TMJ, one at the anterior fibers of temporal muscle and other at the center of masseter muscle. Eight sessions of applications area done and follow up care of 7, 30 and 60 days after the last session. Thirty patients are into treatment. Their selection was randomly for groups of treatment, resulting in 10 patients for each group (infrared LED, red LED and Placebo). Seventy per cent of all patients under both LED treatment, red and infrared, became better, considering pain sintomatology and oral aperture, showing similar results in comparison with control group. LED therapy can be indicated to treat TMJs disorders as lasertherapy, under the same parameters of wavelength and fluency.

P57
FULL LASER SINUS LIFT

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Purpose: to show, with a practical case, the alternative soft and hard tissue preparation for an external sinus lift and implant bed preparation with laser for inserting two 10 mm implants in a 5 mm bone ridge in the region 25,26 without using scalpels or burs.
Material and Methods: the Er,Cr:YSGG (2780 nm, 20 Hz, 140 µs, 6 W, 300 mJ) laser with different tips was used on a patient in own private practice. The incision was done with 100 mJ and 400 µm tip diameter and the bone window and cavity preparation with 250 mJ and 600 µm tip diameter. The bony cavity walls were condensed with hand instruments and while inserting the implants to optimize the primer stability in the soft maxilla bone. Inserted implants: Tapered Screwvent 4,7 x 10 mm. No membranes or bone graphts were used. The time needed did not accede the time needed for the conventional method. Non resorbable sutures 4.0 were used. After 6 moth of healing, the abutments and crowns were installed.
Results: sufficient primer stability was achieved. Quick wound healing and hardly any pain or swelling posts OP were seen. Osseo-integration was without any complication and the x-ray three years later showed new bone growth around the apices of the implants.
Conclusion: soft and hard tissue cuts are easily done with the Er,Cr:YSGG laser using the appropriate parameters. There is less bleeding, no smear layer and always a clear operation field. Preparing a congruent hole for the implant needs some skill but macroscopic round cavities can be achieved. Lasing is a very safe procedure without the risk of unwanted sliding away of the bur or scalpel and hurting surrounding tissues. Using a laser means simpler logistics. No drilling means patients comfort. Laser means a 'sterile' operation and no need for antibiotics. In case of an external sinus lift, the laser has proven to be a safer and more comfortable instrument for the surgeon as well as for the patient.

WOUND HEALING

P58
THE USE OF LIGHT PHOTOBIOMODULATION ON THE TREATMENT OF SECOND DEGREE BURNS: A HISTOLOGICAL STUDY ON A RODENT MODEL

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The aim of this investigation was to compare, by light microscopy, the effects of the use of Laser Photobiomodulation (LPBM) and Polarized Light (PL) on 2nd degree burns on rodents. Burns are severe aggressions which results on the loss of fluids of the tissues, destruction of the tissue, infection and shock. On severe and extended 3rd degree burns death may occur. Several light sources have been suggested as efficacious on improving wound healing. Forty five animals were used on this study. A 2nd degree burn was created in the dorsum of each animal. The animals were distributed into 4 groups: LPBM (λ660nm or λ780nm, 35/40mW, Θ ~ 2mm, 4 X 5J/cm^2), illuminated with a PL source (λ400 to 2000nm, 40mW, 2.4 J/cm^2/min), and untreated animals acted as controls. The treatment, when indicated, was started immediately after burning in 4 points around the burn (5J/cm^2). The illumination with the PL was performed according to manufactures' instructions. Treatments were repeated at 24h intervals during 7 days. Animal death occurred after 3, 5, and 7days. The Specimens were routinely cut and stained and analyzed by light microscopy using HE and Sirius red stains. The analysis of the results demonstrated that the damaged tissue was able to efficiently absorb and process the light all used wavelengths. It seems that LPBM at λ660nm showed better results at early stages of wound healing. However, the use of λ780nm Laser light showed beneficial effects throughout the experimental period making the newly formed tissue similar to the usual dermis. Despite our findings be indicative that the use of both Light sources improved the healing of 2nd degree burns at early stages, long term assessment is needed in order to verify if this improvement will also influence the final result of the treatment.

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EFFECTS OF LASER PHOTOBIOMODULATION ON CUTANEOUS WOUNDS TREATED WITH MYTOMICIN C: A HISTOMORPHOMETRIC AND HISTOLOGICAL STUDY IN A RODENT MODEL

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Wound healing happens due to a competitive mechanism between the synthesis and lyses of the collagen. Because of that, any factor that increases the lyses or reduce the synthesis of the collagen may result on changes on the healing process. Mitomycin C (MMC) is an antineoplastic antibiotic that inhibits fibroblast proliferation and collagen synthesis and neoangiogenesis. Laser Photobiomodulation (LPBM) has been shown to stimulate wound healing, increase of the production of collagen, fibroblastic proliferation and angiogenesis. The present study aimed to assess histologically the effect of LPBM on skin wounds treated with MMC. Forty Eight Wistar rats were randomly distributed into 4 main groups (n=12): G1 – Control (G1a- 7 days and G1b- 14 days); G2- MMC (G2a- 7 days and G2b- 14 days), G3 - λ690nm Laser (G3a- 7 days and G3b- 14 days); and G4 - λ790nm Laser(G4a- 7 days and G4b- 14 days). Under general anesthesia, one excisional wound was created on the dorsum of each animal. Two milliliters of MMC solution was applied to the wound 4h after surgery during 5 min. LPBM was performed on groups G3 (λ690nm; 20J/cm^2; 30mW; Φ=2mm) and G4 (λ790nm; 20J/cm^2; 40mW; Φ=2mm) and started immediately after the application of the MMC and was repeated at every other day during the experimental period. Laser light was applied transcuneously in 4 equidistant points on the wound margin (4 x 5J/cm^2, 20J/cm^2/ session). The specimens were routinely cut and processed to wax. The slides were stained with HE and Sirius red. Computerized Hystomorphometry was performed. The findings of the present study were indicative that LPBM resulted on less inflammation and on both increased fibroblast proliferation and collagen deposition on subjects in which wound healing was impaired by Mytomycin C.

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LASER PHOTOBIOMODULATION AT λ660NM OR λ780NM ON THE REPAIR OF THIRD DEGREE BURNS ON DIABETIC RATS

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The aim of this investigation was to compare by light microscopy the effects of Laser photobiomodulation (LPBM) at λ660nm and λ780nm on third degree burns on diabetic Wistar rats.Burns are severe aggressions which results on the loss of fluids of the tissues, destruction of the tissue, infection and shock that may result on death. Diabetes is a disease that may reduce the ability of the body on healing properly. LPBM has been suggested as an efficacious method of improving wound healing. A third degree burn measuring 1.5 X 1.5cm was created in the dorsum of 55 animals whose were distributed into 3 subgroups treated of not with LPMB (λ660nm or λ780nm, 35mW, Θ ~2mm, 20J/cm^2). The treatment when indicated (G2 and G3) was started immediately after burning in 4 points around the burn (5J/cm^2) and repeated at 24h intervals during 21 days. The animals were humanely killed after 3, 5,7,14 and 21 days by an overdose of intraperitoneal GA. The Specimens were routinely cut and stained and analyzed by light microscopy. We found that the use of λ660nm was more evident at early stages and acted positively on inflammation, amount and quality of the granulation tissue, fibroblast proliferation, and on both collagen deposition and organization. Epithelial pavementing and local microcirculation were also positively affected by the treatment. The use of λ780nm laser light was not so well evidenced but it had positive effect at early stages on the onset and development of the inflammation. At the end of the experimental period the effect was mainly on the amount and quality of the granulation tissue. The use of λ660nm and 20J/cm^2 at daily basis was more effective than the use of λ780nm laser light on improving the healing of third degree burns on diabetic animals since early stages after wounding.

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EFFECTS OF DIFFERENT WAVELENGTHS ON VIABILITY OF SKIN FLAP: HISTOLOGICAL STUDY ON DIABETIC RATS

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Skin flap is a common surgical procedure used in plastic and reconstructive surgeries. Failure on flap survival is mainly due to inadequate vascularization as poor blood supply is responsible for tissue necrosis. Diabetes is a metabolic condition also responsible for poor blood supply. The use of Laser Photobiomodulation has been shown to increase deposition of collagen fibers and improve neovascularization. The aim of the present investigation was to assess histologically the effects of different 2 laser wavelengths on the viability of skin flaps on diabetic rats. Twelve Wistar rats were divided into 3 groups (n=4): control; λ660nm laser, and λ780nm laser. Diabetes was induced with streptozotocin (60mg/kg) as previously reported by our group. A pedicled flap was created on the dorsum of the animals under general anesthesia. A plastic sheet was interposed between the flap and the bed in order to further reduce blood supply. Laser irradiation was carried out immediately after the surgery and repeated at 48 hours intervals on 10 points around the margins of the flap (10 x 4J/cm^2) during 7 days (30/40mW,ϕ ~ 3mm, Dose per session of 40J/cm^2, treatment dose of 120J/cm^2). The animals were killed 7 days after surgery, specimens were routinely cut and stained with HE and Sirius red stains and analyzed by light microscopy. The results evidenced that the group treated with λ660nm laser showed significant intense formation of granulation tissue (p=0.03). It is concluded that the use of λ660nm laser was efficient on improving angiogenesis and on the increase the viability of pedicled skin flap on diabetic animals.

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HISTOMORPHOLOGICAL EVALUATION OF THE EFFECT OF LOW LEVEL LASER ON THE EXPERIMENTALLY INDUCED INJURIES ON THE SUPERFICIAL DIGITAL FLEXOR TENDON IN HORSE

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Objective: To assess the efficacy of low level laser on functional tendon tissue recovery in experimentally induced injuries
Study Design: Using 8 adults castrated horses having 290 to 420 Kg/BW with 3 to 10 years of age. The mid- left hind limb superficial digital flexor tendon was splitted longitudinally in full thickness of 10 cm in length using B.P.blade (15 Time strikes), then the connective tissue and skin was approximated using No 2 Nylon. Horses were divided into two groups of control and treated with 4 horses each. No treatment was given to control one, whereas treated group was subjected to LLL therapeutic regimens of Mustang 2000 for 15 minutes (5 minutes diode laser with 630 nm and 10 minutes infrared

with 890 nm wave length) daily contact method for 15 continuous days . The samples from control, treated and normal contra lateral limb were collected on day 60 for assessing the histomorphological changes.
Results: The histological findings were consistent within the group. The treated tendon was composed of bundles of collagen which were separated by strands of connective tissue, the endotenon with network of blood vessels .The longitudinal sections showed the collagen bundles were arranged in parallel with undulating waveform with reduction of adhesion, whereas in the control group collagen fibres had no organization as far as parallel arrangement of bundles of tendon is concerned. The increase diameter of adhesion leading delay of healing was highlighted in this group.
Conclusion: Low Level Laser besides being effective in superficial wound healing, significantly accelerated functional recovery, as far as early organization of collagen fibres in severed tendon in horse is concerned.

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A COMPARATIVE STUDY ON THE EFFECTS OF LASER PHOTOBIOMODULATION (λ660NM OR λ780NM) ON THE HEALING OF THIRD DEGREE BURNS: HISTOLOGICAL STUDY IN RATS

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The aim of this investigation was to compare by light microscopy the effects of Laser photobiomodulation at λ660nm and λ780nm on third degree burns on Wistar rats. Burns are severe aggressions which results on the loss of fluids of the tissues, destruction of the tissue, infection and shock that may result on death. Laser light has been suggested as an efficacious method of improving wound healing. Fifty five animals were used on this study (n=55). A third degree burn measuring 1.5 X 1.5cm was created in the dorsum of each animal. The animals were distributed into three subgroups which were treated of not with Laser photobiomodulation (λ660nm or λ780nm, 35mW, Θ ~ 2mm, 20J/cm^2). The treatment when indicated (G2 and G3) was started immediately after burning in four points around the burn (5J/cm^2) and repeated at 24h intervals during 21 days. The animals were humanely killed after 3,5,7,14 and 21 days by an overdose of intraperitoneal GA. The Specimens were routinely cut and stained and analyzed by light microscopy. The results showed higher deposition of collagen fibers, larger amounts of granulation tissue, less edema, better inflammatory reaction and revascularization on all laser-treated subjects. These were more evident at early stages when λ660nm laser was used and throughout the experimental period when λ780nm laser light was used. It is concluded that Laser photobiomodulation, on both wavelengths, was capable of improving the healing of third degree burns on rats.

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THE EFFECTS OF LOW – LEVEL LASER THERAPY ON BONE IN DIABETIC AND NON – DIABETIC RATS

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Objective: The aim of present study was to examine effects of low – level laser therapy (LLLT) on tibia of streptozotocin–induced diabetic (STZ–D) rats.
Background data: LLLT has been found to accelerate fracture healing in animal. Diabetes Mellitus decreases bone volume and also biomechanical parameters.
Materials and methods: Twenty rats were divided randomly into four groups. Rats in first two groups were administrated a single injection of STZ to induce diabetes ,while animals in groups 3 and 4 were given a sham injection of distilled water .Right tibia of groups 1 and 2 were treated with a He– Ne laser (632.8 nm, 10 m W) of 28.6 and 636.9 J/cm^2 respectively. LLLT was performed daily for 14 consecutive days. Right tibia of rats in group 3 were treated with LLLT the same as LLLT of group 2. Right tibia of rats in group 4 were used for based line studies .After 14 days, right tibiae and left tibiae (control bone) were extracted and were subjected to three points bending test and histological study.
Results: Maximum force (N) was significantly greater in laser– treated bones of groups 2 and 3 compared with their relevant control groups (Paired student t test, p=0.05 and p=0.007 respectively). Density of bone lamellae meshwork of compact bone in group 2 was significantly more in comparison with its control group (Paired student t test, p = 0.005).
Conclusion: LLLT on tibia of STZ – D rat increased bone lamellae meshwork density of compact bone and also increased its strength.

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