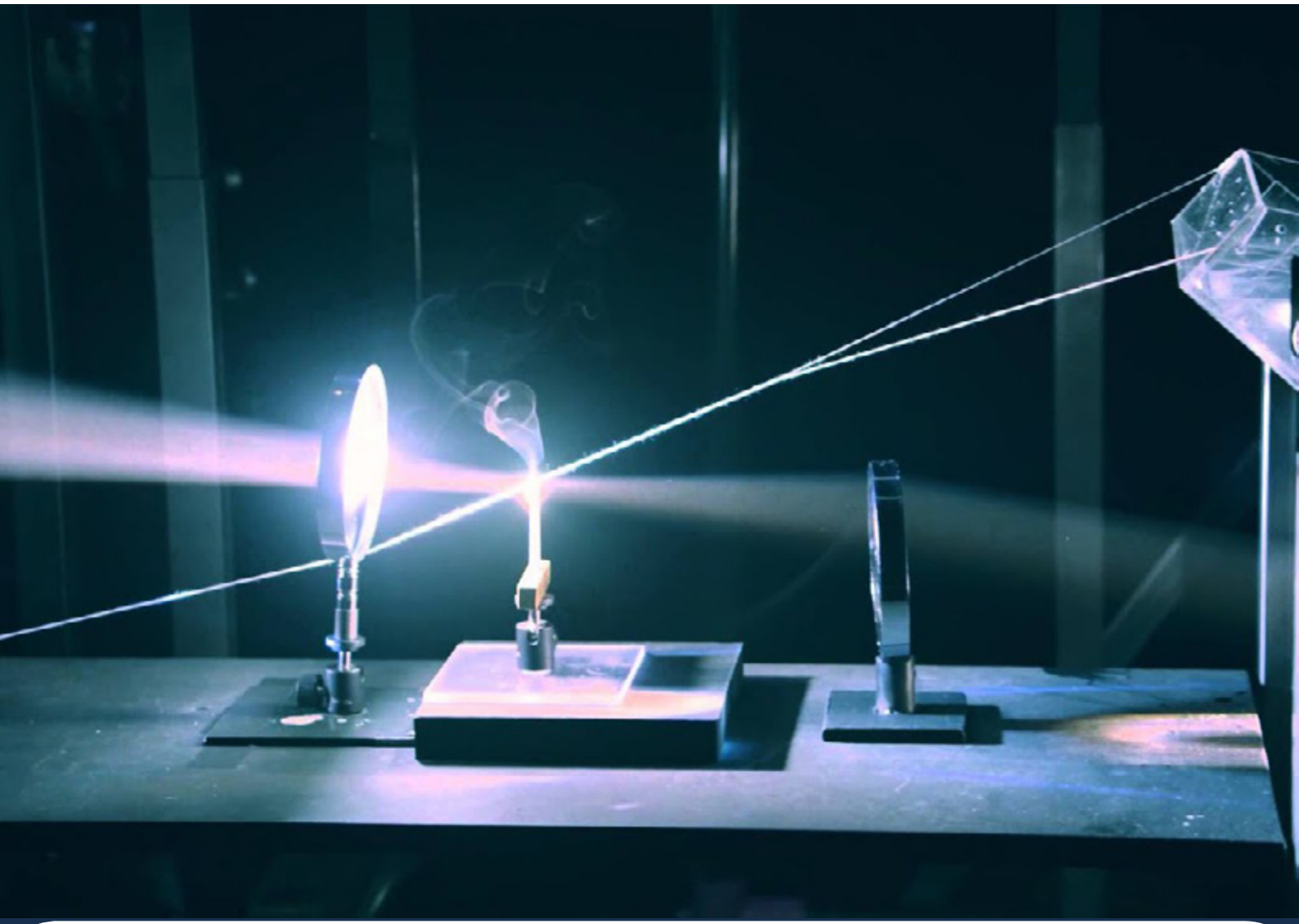
Proceedings of

Virtual Online Conference on

ADVANCEMENTS OF LASER, OPTICS & PHOTONICS

September 02-03, 2020



HOSTING ORGANIZATION

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Linkin Science

Exploring & Connecting Science

Mission

Our mission is to bring the researchers on a common platform and provide opportunity for them to interact. This scientific networking helps for the betterment of science by exchanging the ideas in a broader way.

Vision

Magnifying Scientific Knowledge by Sharing the research and ideas. We believe in accelerating the possibilities of novel discoveries and enhancement in scientific research, by connecting scientific community for knowledge sharing.

Why Linkin Science

Join us to redefine and explore new research, to provide a credible source to barter ideas for scientific studies. To revolutionize the true outcome of a distinct scientific discovery and grab the attention for rare emerging technologies.

Linkin Science Conferences

Linkin Science conferences are well crafted and designed by a team of skilled experts. Our conferences are vast expanded into Medical, life sciences, health care, Engineering and other social sciences. Each conference, summit or executive briefing is tailored to the sector, topic and audience need. Our event structure varies depending on issue and market requirements featuring Keynote presentations, Oral talks, Poster presentations, Young research forum, Exhibitions, roundtables and variable formats.

Welcome to Linkin Science

Linkin Science organizes a wide range of scientific events worldwide and thus evolving to be a hub for scientists, researchers, doctors, students, industries and delegates. We are dedicated to provide high-quality online Journals, Conferences, events and information, through unparalleled speaking sessions, workshops and unique face-to-face networking opportunities. This Scientific Networking creates meaningful relationships with like-minded professionals that elevate the conference experience for the participants. We value the research and other scientific prospects and works done by individuals.

We schedule different Medical, Health Care, clinical and engineering conferences to establish divergent platforms for delegates and other scientific researchers. Each conference, summit or executive briefing is tailored to the sector, topic and audience need. Our event structure varies depending on issue and market requirements. Keynote presentations delivered to all works for some content, whilst other conferences feature multiple breakout sessions, panels, roundtables and variable formats.

A team of highly skilled committee members dwell upon the trending topics of research to create a conference theme which can be used to exhibit ideas and research works among the scientific group laying the path for scientific discoveries.

Welcome Message

Linkin Science welcomes you all to the the Virtual Online Conference On Advancements Of Laser, Optics & Photonics to be held during September 02-03, 2020. We anticipate, your participation at Laser, Optics & Photonics 2020 which catalyses ideas and enhance new interdisciplinary collaborations.

Laser, Optics & Photonics 2020 are rapidly expanding by playing a prominent role in many fields. This Conference is a platform to Industry, Academia, Researchers, Innovators to come together to discuss the research activities, advancements, ideas and exhibit laser, optics & photonics products.

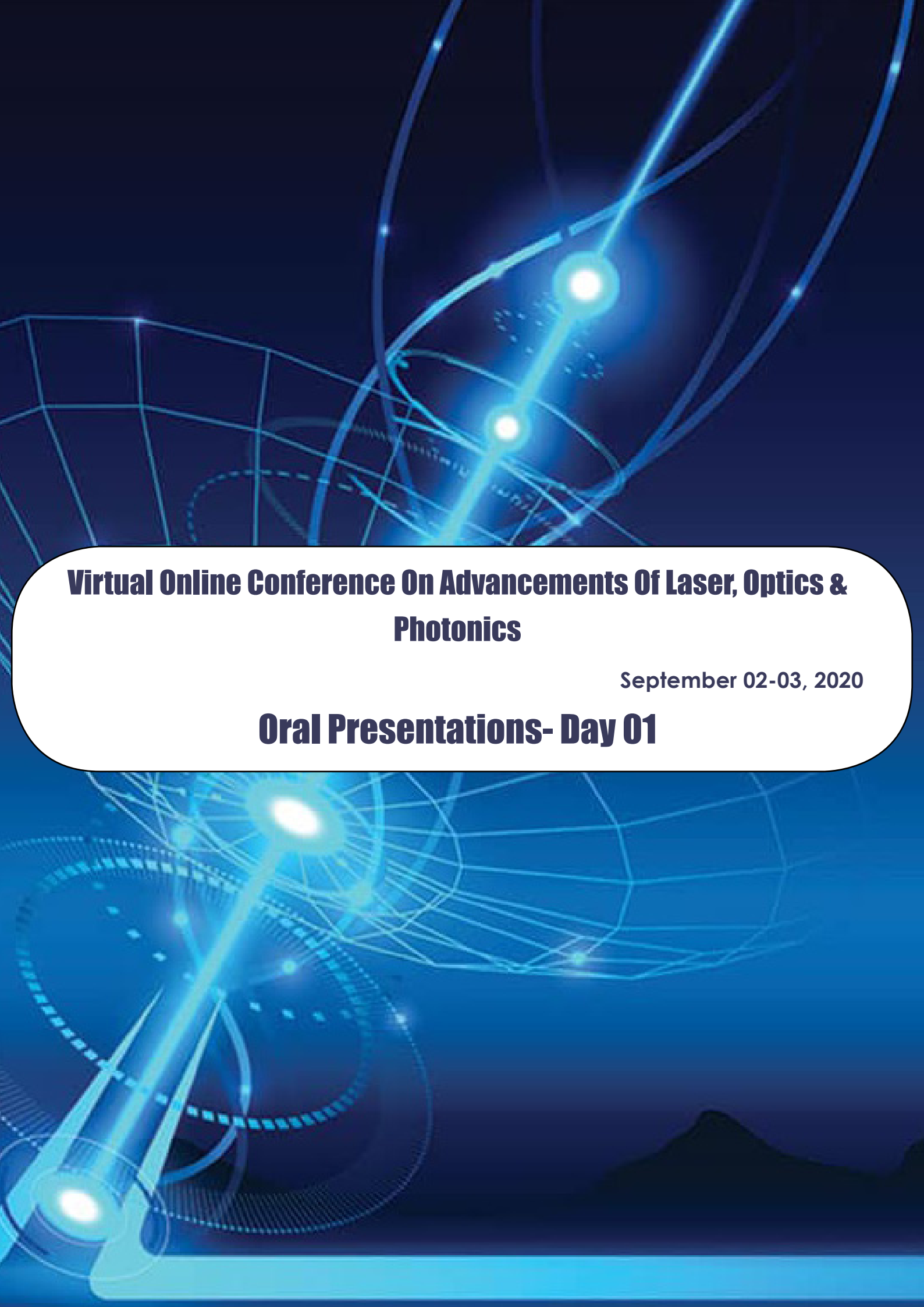
Laser, optics & photonics is rapidly gaining traction across a range of industries, from agriculture to water treatment to energy storage. Today, laser, optics & photonics is one of the most innovative, cutting-edge areas of scientific study and it continues to advance at staggering rates. Laser, optics & photonics have made some of the greatest advancements in pediatric optometry & skin laser resurfacing. Scientists in the laser, optics & photonics fields are focused on determining how future drifts in laser, optics & photonics. While laser, optics & photonics are their recent application & trends in it, the benefits are clear with it. Scientists and engineers are focused on applying laser, optics & photonics to resolve these issues. Laser, optics & photonics have been hailed as the next big thing for decades, but it is only now that it is truly becoming a reality in the medical device space.

Our exciting scientific program will be presented over the course of three days in various session types Keynote Presentations, Oral sessions, Young research forum, symposia, Poster sessions and workshops.

Highlights of Conference

- Keynote Talks
- Best Poster Awards
- Outstanding Abstract
- Best Research
- Young research Forum (YRF)

Regards,
Scientific Committee



Virtual Online Conference On Advancements Of Laser, Optics & Photonics

September 02-03, 2020

Oral Presentations- Day 01

Monitoring and Diagnosis of the Process of Shrinkage and Crack Formation in Concrete Using Holographic Interferometry

Giorgi Dalakishvili*, Konstantine Khazalia, Giorgi Turmanidze, Otar Sajaia

Georgian Technical University, Georgia

Concrete is the main building material for hydro construction. Therefore, it is very important to study long-term processes, such as shrinkage, creep, swelling, temperature, and crack resistance, which affects its strength. Known methods do not fully describe these processes in materials such as concrete and reinforced concrete. In this paper, an application of holographic interferometry is considered which enables to evaluate qualitatively and quantitatively the deformation of a solid body and the processes of shrinkage, crack formation and development of concretes of different compositions. A holographic plate is exposed twice before chemical processing - for the first time when the surface of the test sample is in the initial condition, and the second time when it is deformed or undergoes any other impact. This is a unique way to simultaneously observe a unified picture of deformation on the whole registered surface of the object understudying and, at the same time, to measure all three components of the displacement vector at any chosen point. Experimental studies are discussed, in particular, such long-term processes as shrinkage and cracking for various fillers and various reinforcing materials. The improvement and development of research methods, as well as a broad introduction of its results in practice, which will further facilitate the reliability and durability of concrete and reinforced concrete structures, one of the major building materials in construction, in particular in hydro-technical construction. This will allow for monitoring and diagnostics during dam construction.

Biography

Giorgi Dalakishvili joined Georgian Technical University (GTU) as a Professor in the Department of Hydro Engineering in 2010. Prior to attending GTU, he was a Head of Department of Management, material-technical and social base for the development at Ministry of Education and Science of Georgia. Up to 1996, he was Head of Department at Institute of Structural Mechanics and Earthquake Engineering. He received his MBA from Georgian Technical University and a Ph.D. from the Institute of Structural Mechanics and Earthquake Engineering of the Georgian Academy of Sciences. He has developed new courses as a Professor at GTU. His primary research interests are in the field of Holographic Interferometry and its applications in monitoring and diagnosis of the process of shrinkage and crack formation in concrete. He was a scientific head of some magister and doctoral thesis. Specifically, he is interested in student experimental works, as well as pedagogies.

Notes:

Special Profiling of the Incident Radiation Flux as an Interesting New Direction in Photoelectronics

Viacheslav Kholodnov

Russian Technological University, Russia

Theory-based, it is shown that inhomogeneous illumination with specific profile shapes along the electric field in a semiconductor can even lead to abnormal photoelectric effects. Depending on the profile shape of the density of the photogeneration rate of charge carriers, phenomena of self-amplification, self-quenching, and sign self-inversion can occur. In the latter case, underexposure of illumination, the current through semiconductor sample decreases (negative photoconductivity). The corresponding photogeneration profiles are calculated. Profiles are defined by parameters of semiconductor material, the temperature of the sample, and the magnitude of electric field strength in the absence of illumination exposure.

The effects are due to a local photoexcited charge. Photoexcited local charge affects the strength of the photoexcited electric field. Such a charge affects the recombination-generation process. Therefore, photoelectric effects are caused by change in the population (which is nonequilibrium) of the recombination level. A similar change of nonequilibrium population occurs with an increase in the concentration of recombination centers leading to a giant splash in lifetimes of mobile charge carriers and transit-time field-depended photoelectric gain. The neutral shape of the illumination exposure profile has been calculated, i.e., when photogenerated charge exists although, but simple will be presented (as in the quasineutrality approximation) in distribution equation for concentration of nonequilibrium carriers. The results can be used to increase significantly in the photoelectric response of semiconductors. For example, a further increase in the giant splash in photoconductivity of a semiconductor is possible with an increase in the concentration of recombination centers.

The results obtained fundamentally change modern ideas about the possible photoelectric effects in semiconductors and can be used to create a new generation of photodetectors of weak optical and short-wave radiation.

Biography

Viacheslav Kholodnov is a leading research scientist at V.A. Kotelnikov Institute of Radio Engineering and Electronics of Russian Academy of Sciences. He is also a professor at the Moscow Institute of Physics and Technology (MIPT Technical University) and the Moscow Institute of Radio Engineering, Electronics and Automation - Russian Technological University. He received MS degree in theoretical nuclear physics from the Moscow Institute of Engineering Physics (TU) in 1967 and doctor of sciences degree in physics of semiconductors and dielectrics in 1990. He is the author of more than 200 journal papers and has written three book chapters. He is author of several tutorials for students and Ph.D. students. His current research interests include the theory of optical and photoelectrical phenomena in semiconductor structures, including multilayer structures with graded-gap layers and avalanche photodiodes.

Notes:

Polarization Handling Devices in High Density Silicon Photonic Integrated Circuits

Francesco Dell'Olio
Polytechnic University of Bari, Italy

In the last two decades, there has been a game-changing transformation of integrated microphotonics. Silicon has become the material of choice to fabricate photonic integrated circuits (PICs) whose complexity is increasing according to Moore's law.
Silicon photonics components and integrated circuits are typically designed, assuming that the propagating mode is either TE or TM. This is due to the high birefringence of the silicon wires commonly used to guide light within them.
Polarization handling devices improve the performance of the silicon PICs by reducing the polarization-dependent dispersion and loss. In addition, the research interest towards polarization division multiplexed transceivers using PICs in stimulating a quickly growing effort on the technical solutions enabling polarization management on-chip.
The talk overviews the approaches currently utilized for designing efficient polarization handling devices in high-density silicon PICs and discuss the most promising strategies for improving the performance of such devices. A few notes on a new ultralow loss and high extinction ratio silicon TM-pass polarizer are given.

Biography

Francesco Dell' Olio received the M.Sc. degree in Electronic Engineering (cumlaude) and the Ph.D. degree in Information Engineering from Polytechnic University of Bari, Bari, Italy, in 2005 and 2010, respectively. Since December 2019, he has been an Assistant Professor at the Polytechnic University of Bari. His research interests include integrated optoelectronics and photonics. He has been involved in several research projects and is the co-author of more than 100 journal articles and conference papers.

Notes:

InAs/InP Quantum Dot Multi-Wavelength Lasers and their applications in Terabit/s Networking Systems

Zhenguo Lu

Advanced Electronics and Photonics Research Centre

National Research Council, Canada

In recent years, we have demonstrated InAs/InP quantum-dot or quantum dash (QD) multi-wavelength lasers (QD-MWLs) around 1550 nm with the frequency spacing from 10 GHz to 1000 GHz and output power of up to 100 MW at room temperature. Because InAs/InP QDs are inhomogeneous gain materials and their mode competition between two adjacent longitudinal modes within the same laser cavity is much less compared to other traditional bulk and quantum well semiconductor lasers, thereby greatly reducing their phase and intensity noises. Those monolithic InAs/InP QD-MWLs can replace many separate lasers for each channel by only a single semiconductor laser chip to solve the obvious cost, power consumption, and packaging problems. Other advantages include compact size, simple fabrication, and the ability for hybrid integration with silicon substrates. In this talk, I will present the design, growth, fabrication, electronic control, and packaging of our developed InAs/InP QD C-band MWLs. Their key technical specifications include L-I-V curves, optical and RF beating spectra, relative intensity noise (RIN), and optical phase noise of each individual wavelength channel, as well as timing jitter, are investigated. The experimental results have clearly shown that their timing jitters, the optical linewidth, and the RIN values for each individual channel can be achieved less than 6 fs, as small as from 100 KHz to 1 MHz and less than -130 dB/Hz from 10 MHz to 20 GHz, respectively. In order to verify the performance of these QD MWLs in Terabit/s networking systems, we have used both PAM-4 and 16-QAM modulation schemes successfully to demonstrate date bandwidth transmission capacity of 5.4 Tbit/s (PAM-4 48 × 28 GBaud PDM) and 10.3 Tbit/s (16QAM 56x23 GBaud PDM) by only using a 34.5-GHz QD MWL chip and a 25-GHz QD MWL chip after 25 km and 120 km of single-mode fiber transmission lines, respectively.

Biography

Dr. Zhenguo Lu is a Principal Research Officer, Team Lead of Photonics, and Project Leader of National Challenge Program "HTSN" at Advanced Electronics and Photonics Research Centre of National Research Council (NRC). He serves as an Adjunct Professor at both University of Ottawa and Concordia University since 2006. After obtaining his Ph.D. in 1992, he was the recipient of the Alexander von Humboldt Research Fellowship to work at the Institute of Semiconductor Electronics, RWTH Aachen, Germany for two years. From 1995 to 1997 he worked at Terahertz Research Centre of Rensselaer Polytechnic Institute, NY, USA. Dr. Lu came to NRC as a Research Officer in 1997. From 2000 to 2002, Dr. Lu was the Director of R & D of BTI Systems Inc. He has re-joined NRC in 2002. Dr. Lu is an expert in photonics devices. He has published over 250 refereed journal and conference papers, and 8 US patents.

Notes:

Non-Dispersing Trojan-Like Wavepackets on Langmuir Type-(2) Click-Clack Balls Oscillatory Model Trajectories in Helium Atom and Quantum Dots

Matt Kalinski
Utah State University, USA

Some time ago we discovered that placing the Langmuir trajectories [1] of the type one i.e. those in the Hoop Earrings configuration in a combination of the symmetry augmented Circularly Polarized (C.P.) electromagnetic field and the magnetic field perpendicular to the planes of both electron parallel circular motions results in classical stabilization of there sulting Langmuir trajectories which therefore can support the stable non-dispersing quantum Trojan Wave Packets [2].

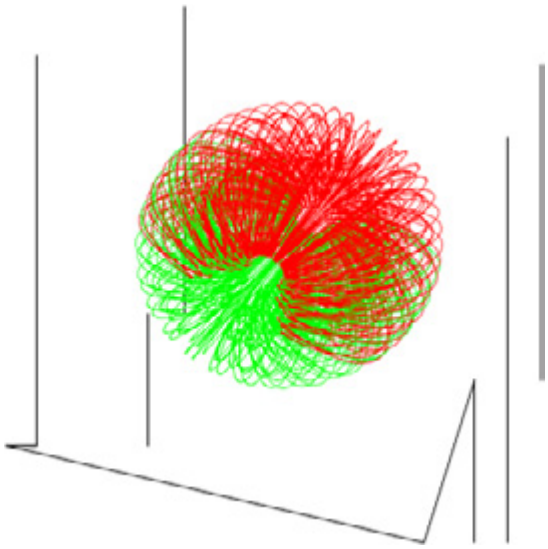


Fig. 1. Perturbed Langmuir two-electron (two-color) trajectories executing the periodic motion of the Click-Clack Balls with the slow click-clacking plane rotation resulted from the intuitive initial condition of the centrifugal forces and the Coulomb forces balance for the Helium nucleus of the charge Z = 2 i.e. $m\omega^2 r = Z/r^2$ $1/(2r)^2$ leading to otherwise circular trajectories if the initial electron velocities were in the opposite direction. Like for the Click-Clack Balls collision, the electrons are approaching each other and reverse the velocities due to the wall effect of the Coulomb repulsion. The initial electron positions for the unit ω are $[(7/4)^{1/3}, 0, 0)]$ and the augmented velocities of both $[0, (7/4)^{1/3}, 0.001]$. Small augmented z-components of the initial velocities are added to obtain the slow bouncing plane rotation. Near perfect original Langmuir trajectories (sharp lines of bouncing on semi-circular trajectories) and without any motion plane rotation can be obtained by scaling the initial velocities only by a factor of 1.09 and cooling the z velocities to 0. The similar trajectories may be obtained by adding the resonant to the field-free motion Linearly Polarized (L.P.) field and the magnetic field which is not changing the trajectory geometry while properly adjusted. In the case of the magnetic field addition the plane of the L.P. field must rotate with the half of the cyclotron frequency (the ”L.P.” field is therefore a superposition of two counter-rotating C.P. fields of a different frequency) to balance the Lorentz force asymmetry and the packets exist in the L.P. plane rotating frame.

We have also considered several other configurations of electrons and fields leading to the existence of the stable, shape invariant Trojan or Trojan-like wave packets of one or two-electrons moving on circular or near-circular orbits. The common feature of those configurations is that the large angular momentum of the electrons is precisely adjusted to the Coulomb, Lorentz, and the electromagnetic field driving force, so each of the electron orbits stays circular and therefore frozen in the rotating frame.

Here we show that the Langmuir trajectories of type two i.e., those corresponding to the popular toy, the Click-Clack Balls when two electrons are moving in one plane on the semi-circular trajectories with the opposite angular velocity, they bounce from each other, reverse the velocities and continue bouncing again and again also support such packets. While the field-free two-electron trajectories are semi-circular for each electron, the properly tuned resonant Linearly Polarized (L.P.) electromagnetic field is acting on each electron on a semi-circle like it was a Trojan electron in the Hydrogen atom. In contrast, the L.P. field is the superposition of two counter-rotating C.P. fields, each component of the field alternately couples to the electron with the proper sign of the angular velocity. To stabilize and confine the system further, the static magnetic field can be added in addition to the resonant L.P. field. In that case, to preserve the symmetry of the trajectories, the polarization plane of the L.P. must rotate with half of the cyclotron frequency corresponding to the magnetic field to balance otherwise asymmetric Lorentz forces acting differently of each of two electrons. Therefore in the former case, the trajectories and the corresponding wave packets moving along them exist in the frame rotating with the plane of the L.P. field polarization i.e., the electron bouncing point is rotating in the laboratory frame.

Unlike for the Trojan wave packets, the packets are not perfectly shape-invariant due to the reoccurring quantum collisions but still are highly confined and non-dispersing.

We use the generalized Gaussian ansatz

$$\psi = N \exp\left[-\sum_{ij} M_{ij} \tilde{x}_i \tilde{x}_j\right], \qquad (1)$$

$\tilde{x}_i = x_i - x_{0i}(t)$ for the packet wave function and solve the equations for the localization matrix ***M(t)*** together with the classical equations of the motion.
We find the non-dispersing wave packets in the joined combination of the external L.P. field and the static magnetic field and the frequency tuned to the natural frequency of the closed periodic orbits drawing the single electron semi-circles. Numerical simulations using the split operator method for the 3D Hartreeap-proximation as well as our recently developed Time-Dependent Quantum Diffusion Monte Carlo Method are also provided.

Notes:

Characterization of broadband ultrashort pulses with amplitude swing

Benjamín Alonso
University of Salamanca, Spain

The measurement of ultrashort laser pulses is key to optimize their applications. Different techniques are available, many of them requiring alignment demanding schemes.

The technique is based on the scan of the relative amplitude of two delayed pulse replicas, followed by their second harmonic generation (SHG) and the detection of its spectrum. A key advantage is its simplicity, as the scan can be performed with a rotating multiple-order waveplate before a linear polarizer. The setup is compact and free of alignment thanks to the in-line bulk interferometer. The nonlinear trace (2D signal) as a function of the amplitude scan and the SHG frequency encodes the pulse information. An optimization algorithm is used to retrieve the temporal intensity and phase of the ultrashort laser pulse.

Firstly, the concept is theoretically studied by means of the derivation of analytical expressions in a simple case, which allows understanding the phase encoding and the key parameters. Then, the technique is validated with numerical simulations and experimental measurements of Ti:sapphire CPA laser pulses below 100 fs duration centered at around 800 nm.

It is studied the tolerance to noise and spectral clipping in the SHG, which is attributed to redundancy in the data of the 2D trace. The influence and possible limitations of different parameters, e.g. the delay and phase retardation, is analyzed, finding that the technique is versatile for the measurement of pulses with different durations and bandwidths. It is shown the use of the frequency marginal of the trace for the pulse reconstruction in the case of non-flat spectral SHG response, which is relevant in the case of ultrabroadband pulses. As an example, in Figure 1, it is shown the retrieval of a pulse together with the SHG response.

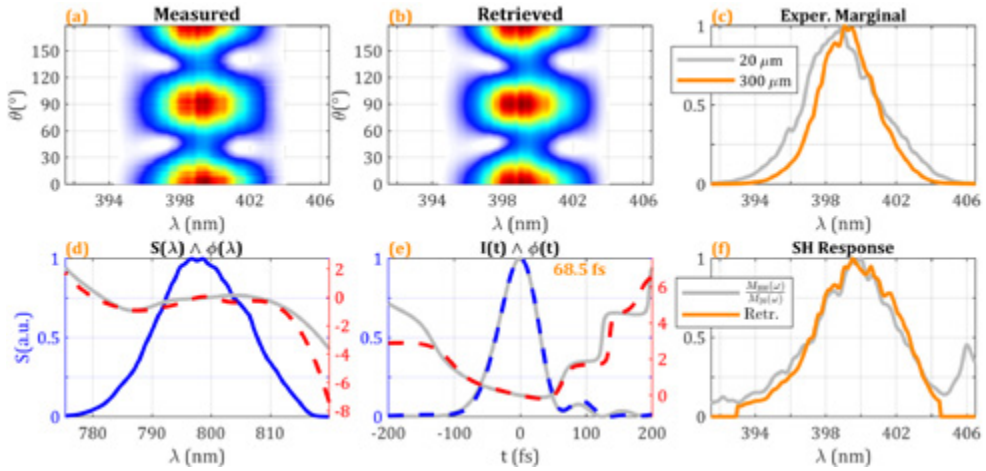


Figure 1. (a) Measured and (b) retrieved traces. (c) Marginals. Retrieved (d) spectral phase and (e) temporal intensity and phase. (f) SHG response.

Biography

Benjamín Alonso completed his PhD in ultrafast laser physics in 2012 from University of Salamanca (Spain). He was postdoc at the University of Porto and the company Sphere Photonics (Portugal), and teacher at different higher education institutions. He is now an assistant professor in Optics and experimental researcher at the femtosecond laboratory of the University of Salamanca. He has worked in different research lines related to nonlinear optics, post-compression of laser pulses, and spatiotemporal and polarization measurement of ultrashort laser pulses. He has published more than 35 papers in reputed journals, books and holds several patents related to ultrashort laser pulse measurements. He has received different international and national awards related to his work.

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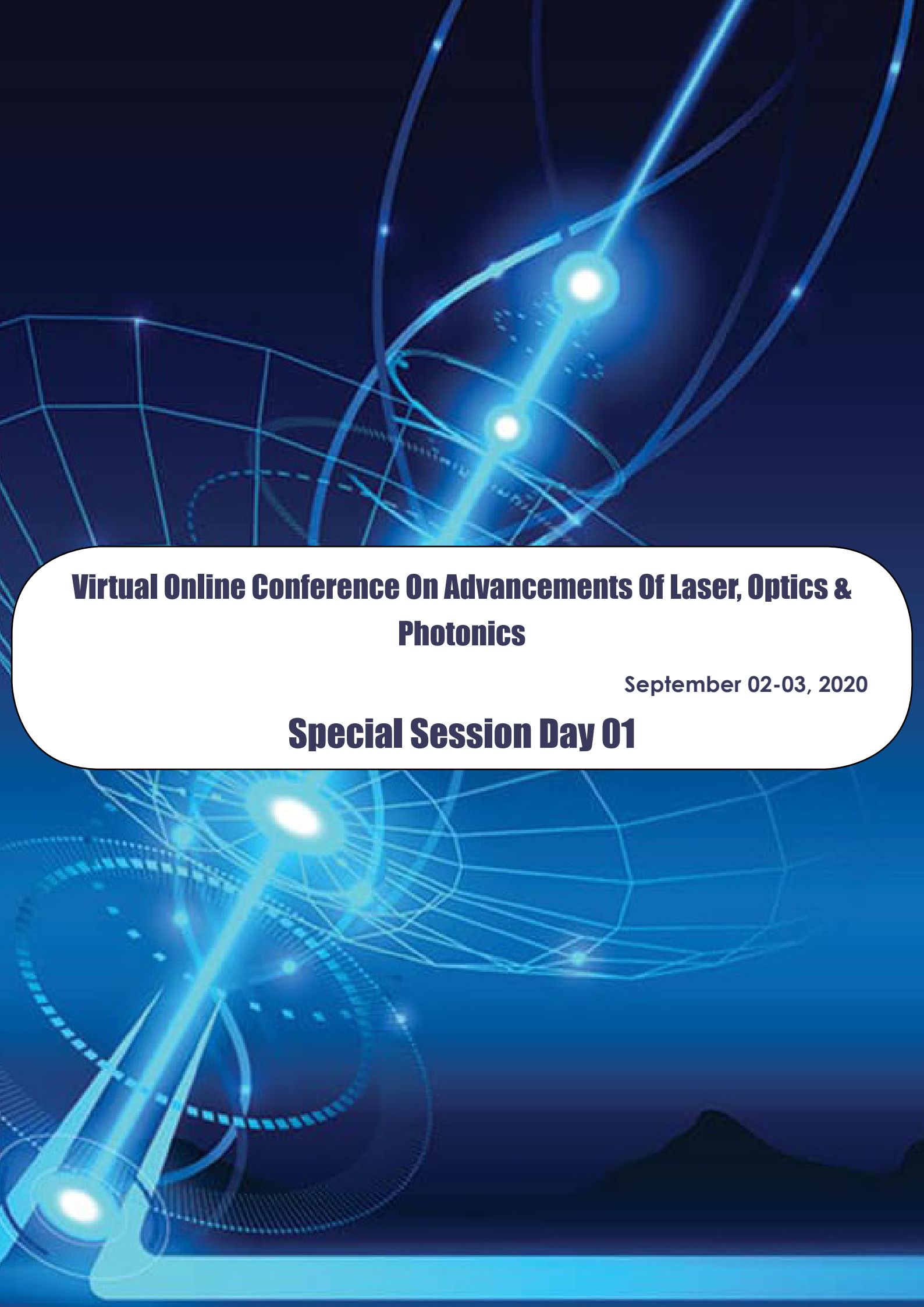


Virtual Online Conference On Advancements Of Laser, Optics & Photonics

September 02-03, 2020

Special Session Day 01

Quantum Oil Refinery: A Viable Path to Meet the Paris Target?

Denis Gendron
Claire Lasers Corporation, Canada

Decline by leading nations (China, USA, and Russia) in support of meeting Paris Target is linked to a lack of scalable solutions ready to be implemented for the reduction of global GHG emissions. Alternative solutions extol benefits yet to be proven scalable, while promote abandoning crude oil altogether. This has already caused significant divestment in large segments of the hydrocarbon industry and poses risks for the supply integrity of refined products (polymer, jet fuel, lubricant). Our work found that the best solution resided in the problem. Reinventing oil refining with modern knowledge of quantum electronics and chemical physics can yield GHG emission reduction to meet Paris Target. We call it quantum oil refinery (QOR) methods. Guided, but not limited, by mechanical and chemical engineering methods, QOR can scale globally in a decade.

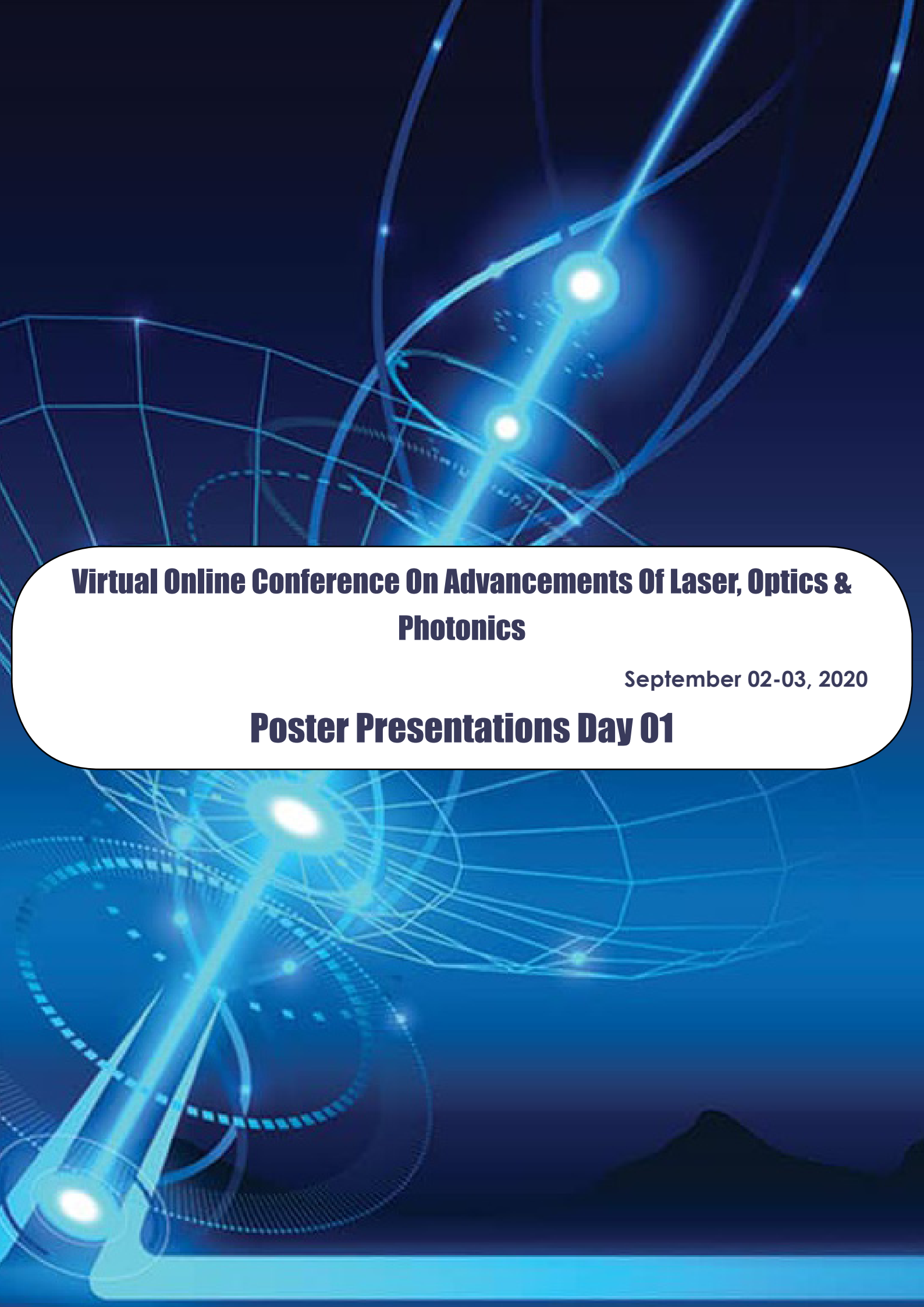
The QOR technology is based on a laser-driven electrically powered chemical reactor, coined the name "Laser Crude Cracking (LCC)", capable to breakthrough advances for cracking heavy oil. The LCC reactor was designed to exceed the performance of FCC used in traditional oil refining. I will present the differences between QOR versus traditional refinery, in terms of basic chemical physics and three electrically driven sub-processes key to QOR performance. QOR improves refinery performances: (i) >25% material conversion efficiency, (ii) >75% reduction of CO2 emission, and (iii) >X3 decrease in energy losses in crude material conversion. Deploying QOR in the refinery market can enable the global economy to meet the 20/20/20 Paris Target.

QOR does not replace new cleaner energy, but since the global economy will depend on mined hydrocarbon for decades, QOR is necessary, since it brings large GHG reduction associated efficiency improvement. Moreover, QOR will herald the transition to electrical transportation because its deployment creates a large increase in market demand for electrical supply. QOR is a CleanTech technology solution for reducing GHG emissions and the depletion problem. As a result of improved material conversion efficiency, QOR can be an instrument of peace, for two reasons: (i) it will reduce the demand on crude oil, and (ii) promote cooperation between leading nations, to build a chain of supply to execute the $5T of global QOR construction business. QOR is a disruptive technology opening a US $5T market that offers high-quality refinery performance; its deployment is practical because it translates into improved refinery ROI. Market forces, not on new taxes, will drive its coming of age.

DJG Page 1 of 2 QOR4ALOP_PARIS_2020JAN08C01

Biography

Denis J. Gendron earned a Physics B.Sc. degree from U. de Sherbrooke in 1988. In 1997, he graduated with Physics Ph.D. from the University of Waterloo for his study of photodissociation and photo-ionization processes at molecular-level with pulsed laser in a supersonic jet. He builds the pulsed laser laboratory of Donna Strickland at UWaterloo (2018 Nobel Prize of Physics). He worked as a laser engineer for national organizations and global corporations: NRC (Ottawa, ON), Fibertek Inc. (Herndon VA) Spectra-Physics Lasers Inc. (SPLI, Mountain View, CA), and Coherent-AMT (now Clarion Medical, Cambridge, ON). In 2003, Denis founded Claire Lasers to serve manufacturing industries, and invitalize inc. a start-up dedicated to life sciences.



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Poster Presentations Day 01

Photophoresis-based Laser Guiding of Airborne Microparticles Using Structured Laser Beams

Alexey Porfirev

Image Processing Systems Institute of RAS—Branch of the FSRC "Crystallography and Photonics" RAS, Samara, Russia

The creation of the optical tweezer was one of the most significant events of the 20th century and provided scientists and researchers in various fields with a unique non-invasive method of three-dimensional trapping and guiding of nano- and micro-objects in a liquid medium or vacuum. In the last decade, active research has been conducted in the field of development of optical traps operating in air, allowing the manipulation and analysis of various aerosol airborne light-absorbing particles. An important feature of the manipulation of light-absorbing particles in the air is that with this method of trapping, the action of radiation pressure becomes almost imperceptible compared with the photophoretic forces resulting from momentum transfer between particles and surrounding gas molecules. It is well-known that the use of tightly focused Gaussian beams perfectly solves the problem of laser trapping and confinement of the nano- and micro-objects, both in liquid and gaseous media. However, the use of various so-called structured laser beams, which have become widespread in many areas of optics and photonics in recent decades, allows one to realize various types of manipulation with the trapped particles, including their rotation and three-dimensional guiding. Here, we investigate passive and active laser guiding of airborne light-absorbing particles using different structured laser beams – superpositions of optical vortex (OV) beams, circular Airy beams (CAiBs), and conventional two-dimensional Airy beams (AiBs). While superpositions of OV beams and CAiBs can be used for the generation of self-healing bottle beams, AiBs allow one to create curved light channels for passive guiding of the trapped particles along the accelerating trajectories. The unique properties of these beams, namely propagation along accelerating trajectories, self-healing, and auto-focusing properties allow one to use them for manipulation of airborne particles hidden behind obstacles. The experimental results demonstrate the possibility of a controlled three-dimensional movement of the agglomerations of carbon nanoparticles.

This work was financially supported by Russian ScienceFoundation (grant No. 19-72-00018).

Association of Trichloroacetic Acid peel with Photobiomodulation in the Treatment of Cutaneous Hand Photoaging: A Controlled, Randomized and Double-Blind Clinical Trial

Marcos Momolli*, Marina Bertoni Guerra, Erick Frank Bragato, Jefferson André Pires and Ana Paula Ligeiro de Oliveira

UNINOVE – Nove de Julho University, Brazil

Photodamage is a growing concern in contemporary society because it promotes early skin aging and different pathologies resulting from prolonged and repeated exposure to ultraviolet solar radiation, which is considered the main extrinsic factor of this process. Affected by radiation, the hands play an important role in the manifestation and visibility of aging, as they are very exposed body regions. Knowing this, a holistic body approach to rejuvenation is necessary, and hand treatment cannot be overlooked. This concern results in a growing rise in minimally invasive rejuvenation treatments capable of providing satisfactory results such as chemical peel and photobiomodulation. The study proposal is developed by the potential mechanism of tissue repair, skin rejuvenation, anti-inflammatory, and analgesic effects of photobiomodulation, complementing the benefits of chemical peel. Therefore, this randomized, controlled, double-blind clinical trial aims to compare the effects of monotherapy with 20% trichloroacetic acid (TCA) peel and the effects of the association of 20% TCA peel with 660nm LED photobiomodulation in photoaging treatment of hands. To achieve this, participants will be divided into two groups of different treatments and the results compared at the end of 4 sessions. Features of photoaging will be analyzed, such as fine and coarse wrinkles, abnormal pigmentation, and an overall assessment of the back of the hands through periodic standardized photographs. A visual analog pain scale and a 5-point Likert scale to assess participants' satisfaction will also be applied at the end of the study.

Notes:

Catalase Gene Expression in UVA exposed Keratinocytes Post Treated with Vegetal Extracts and Photobiomodulation

Gabriela Benedito Machado* and Christiane Pavani

UNINOVE – Nove de Julho University, Brazil

Skin photoaging is induced by ultraviolet radiation that leads to the formation of reactive oxygen species (EROS). Vegetal extracts present high antioxidant capacity due to polyphenols content. They act by reducing the concentration of the oxidizing species in the tissue and reducing inflammation, among others. Photobiomodulation (PBM) is a technique known by inducing cellular activity, ATP levels, modulating inflammation, etc. The combination of the antioxidant capacity of vegetal extracts and PBM seems to be a promising combination in order to reduce the harmful effects of UVA radiation. The objective of this work was to evaluate the catalase gene expression in human keratinocytes exposed to UVA after receiving vegetal extracts and PBM. For this, human keratinocytes (HaCaT) were seeded in 35mm well plates (150,000 cells/plate) and, after attachment was exposed to UVA (366 ± 10 nm, 2.5 mW / cm², 5400 sec). Then, treated with Chamomile (Chamomilla recutita Flower Extract) and Fig (Ficus carica Fruit Extract) extract at 0.3% for 24 hours and, finally, PBM (640 ± 12 nm, 2.6 mW/cm², 420 sec). At the end of the treatments, cells were kept in the incubator for 24 hours. RNA was extracted, and catalase gene expression was detected by quantitative PCR. In the dark, Chamomile increased catalase gene expression showing a photoprotective potential. UVA reduces the gene expression, while Chamomile use combined to PBM, showed an increased gene expression in relation to the UVA group. Fig extract does not alter the catalase gene expression in any treatment.

Notes:

The Association of Photobiomodulation and Low-Frequency Ultrasound in Reduction of Localized Fat: A Study Protocol

Michelle Mota Sena*and Christiane Pavani

UNINOVE – Nove de Julho University, Brazil

The current routine that includes stress and sedentary lifestyle, alcohol consumption, smoking, poor eating habits, and low sleep quality, when combined with genetic factors, are directly related to overweight and fat deposits formation. This interferes with self-esteem and quality of life for a large part of the world population. Aesthetic resources destined for localized fat treatment, such as photobiomodulation and low-frequency ultrasound, although seem promising, have low scientific support for the combined use. This study will aim to compare the effects of photobiomodulation, low-frequency ultrasound, and the association of these techniques in abdominal localized fat. The main outcome will be abdominal skinfold thickness. Secondary outcomes will include anthropometric parameters, the temperature of the treated region, and biochemical and liver enzymatic markers will be evaluated. Visual changes due to treatments will also be assessed through photographic records. Finally, the subjective assessment will be collected through questionnaires that measure the quality of life (WHOQOL-BREF), the body self-image scale (BSQ-34), and the degree of patient satisfaction. The mechanism by which photobiomodulation acts in lipolysis is related to the production of reactive oxygen species that interact with the plasma membrane through lipid peroxidation, while low-frequency ultrasound seems to destabilize the membrane due to cavitation. Thus, both are involved on release of triglycerides present in adipocyte deposits for interstitial space, so it is expected that the combination of these techniques will lead to a greater reduction in the abdominal skinfold when compared to the isolated application of each technique.

Notes:

Antimicrobial Photodynamic Therapy in *Candida Albicans* using Methylene Blue in Water and associated with Sodium Dodecyl Sulfate: A Dosimetry Study

José Marcelo*, Lacerda Alves Gonçalves and Christiane Pavani

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Methylene Blue (MB) is a compound that has been widely investigated as an antimicrobial agent for Photodynamic Therapy (PDT). Recently, our research group showed that the control of aggregation, through the association of MB with sodium dodecyl sulfate (SDS) potentiates the PDT action. However, in addition to optimizing the vehicle used, dosimetry also plays an important role in the outcome of therapy. The objective of this study is to compare the dosimetry of MB mediated PDT both in water and associated with SDS in *Candida albicans*. The fungi will be placed in two 48-well plates with their treatment (control; MB aqueous solution; SDS 0.25%; MB + SDS 0.25%). Then, the samples will be homogenized and incubated in the dark for 5 minutes. After incubation, one plate will be the plate that has been exposed to light (659 ± 9nm, in different dosimetry, i.e., keeping the irradiance constant and varying radiant exposure; later, doing the opposite). At the end of the irradiation, the samples will be diluted in ultra-pure water (10 to 100000 times). The dilutions will be spread on sabouraud dextrose agar and placed in an incubator at 37°C for 24 hours. After this period, colonies will be counted. This work will show the most important dosimetric parameter (irradiance or radiant exposure) for antimicrobial PDT.

Notes:

Study Protocol for the use of Photobiomodulation with Red or Infrared LED on Waist Circumference Reduction: A Randomized, Double-Blind Clinical Trial

Marcelo Marreira*, Lidiane Rocha Mota, Daniela Fátima Teixeira Silva and Christiane Pavani

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The search for non-invasive aesthetic procedures for localized fat reduction has gained attention. Some studies have shown that Photobiomodulation (PBM) can be used in body contouring. However, there is no standardization of the protocol. The objective of this study will be to compare the different light wavelengths when using PBM as a technique for the reduction of abdominal waist circumference. 174 patients will be recruited, and then divided into 3 groups: RED PBM; INFRARED PBM; and PLACEBO (Sham). The treatments will consist of eight sessions, twice a week, for four weeks. At each session, the participants will receive 30 minutes PBM (127 J/cm2), and further, both groups will receive 30 min Aussie Current (4kHz, modulated at 10Hz, 40-60mA). The main outcome of this study will be waist circumference reduction. The secondary variables will be anthropometric data, lipid profile, liver function, changes in the local microcirculation, and the quality of life and self-esteem. The analyses will be performed at four stages of the research, D0, end of the eighth session, 15 days after the last session, and 180 days after the last session. This work will show the efficacy and the best wavelength for PBM when using for waist reduction. Since it will be expected that PBM release of triglycerides from adipocytes, Aussie current will act on the increase of b-oxidation. The control of the lipid profile is important since the availability of triacylglycerol may affect the lipid profile in the blood, bringing consequences for the general health of the individual.

Notes:

Comparative study between Photodynamic Therapy with Urucum + Led and Probiotics in Halitosis reduction – Protocol for a controlled clinical Trial

Pamella de Barros Motta[1*], Lara Jansiski Motta[1], Ana Carolina Costa da Mota[1], Marcela Letícia Leal Gonçalves[1], Tamiris Silva[1], Ingrid Horçaria Feriati Campo[2], David Casimiro de Andrade[3], Kristianne Porta Santos Fernandes[1], Raquel Agnelli Mesquita-Ferrari[1], Alessandro Melo Deana[1], Mark Wainwright[4], Renato Araujo Prates[1], Anna Carolina RattoTempestini Horliana[1] and Sandra Kalil Bussadori[1]

[1]Universidade Nove de Julho, Brazil

[2]Dental surgeon

[3]University of Porto, Portugal

Halitosis is a term that defines any foul odor emanating from the oral cavity. The origin may be local or systemic. The proposed project aims to determine whether treatment with antimicrobial photodynamic therapy (aPDT) and treatment with probiotics are effective at eliminating halitosis. 52 patients from 18 to 25 years old with a diagnosis of halitosis ($H_2S \geq 112$ ppb determined by gas chromatography) will be randomly allocated to four groups (n=13) who will receive different treatments: Group 1 – treatment with teeth brushing, dental floss and tongue scraper; Group 2 – brushing, dental floss and aPDT; Group 3 – brushing, dental floss, and probiotics; Group 4 – brushing, flossing, aPDT, and probiotics. The results of the halimeter testing will be compared before, immediately after, seven days and thirty days after treatment. The microbiological analysis of the coated tongue will be performed at these same times. The quantitative analysis will be conducted using real-time PCRq. The normality of the data will be determined using the Shapiro-Wilk test. Data with normal distribution will be analyzed using analysis of variance (ANOVA). Non-parametric data will be analyzed using the Kruskal-Wallis test. The Wilcoxon test will be used to analyze the results of each treatment at the different evaluation periods. This study has been approved by the Ethics Committee of UNINOVE under process number 3.669.442. Results will be published in peer-reviewed journals and will be presented at national and international conferences.

Notes:

Photobiomodulation on IL-6 And TNF- α Synthesis of Myoblasts Cultivated in M1 Macrophage-Conditioned Media

Tainá Caroline dos Santos*, Maria Fernanda Setubal Destro Rodrigues, Sandra Kalil Bussadori, Kristianne Porta Santos Fernandes and Raquel Agnelli Mesquita Ferrari

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Macrophages are key effector secreting products that can modulate the immune response during all phases of the inflammatory and tissue repair processes. Photobiomodulation therapy (PBM) with a low-level laser has been shown positive effects during the muscle repair process, modulating the cells involved in the inflammatory process, especially the macrophages. The aim of this study was to evaluate the effects of PBM on the synthesis of cytokines IL-6 and TNF-α in myoblasts cultivated in the presence of an M1 phenotype macrophage-conditioned medium previously submitted to the same irradiation parameters. J774 macrophages were activated with interferon-γ and lipopolysaccharide for 2h to induce the M1 phenotype. Irradiation was performed once using an AlGaAs diode laser (780 nm, 70 mW, 0.04 cm^2, 15 s, 1 J). C2C12 myoblasts were cultivated in a proliferation medium (DMEM + 10% FBS) and were irradiated with the same parameters used for the macrophages. After PBM, the myoblasts received 30% of M1 macrophage-conditioned medium (MCM1) from irradiated (+PBM) and non-irradiated macrophages. The IL-6 and TNF-α protein levels were detected 24 and 48h after C2C12 irradiation using ELISA kits. Untreated and PBM-treated myoblasts exhibited lower IL-6 levels in the presence of irradiated MCM1 at 24 and 48h. PBM treated myoblasts that received MCM1+PBM showed lower TNF-α levels after 24h in comparison to untreated myoblasts in non-irradiated MCM1. After 48h, untreated and PBM treated myoblasts exhibited lower TNF-α levels in the presence of MCM1+PBM. PBM performed concomitantly on myoblasts, and proinflammatory macrophages were able to modulate the synthesis of IL-6 and TNF-α protein levels.

Notes:

Photobiomodulation after Third Molar Extraction: A Systematic Review for Cost-Effectiveness Protocol

Thalita Molinos Campos*, Sandra Kalil Bussadori, Anna Carolina Ratto Tempestini Horliana, Kristianne Porta Santos Fernandes and Lara Jansiski Motta

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One of the most performed procedures in dentistry is the extraction of third molars, a surgery that causes a lot of discomfort to patients, with pain, edema, and trismus due to surgical trauma. To reduce these negative post-surgical effects, anti-inflammatory drugs are prescribed after extraction, but these drugs can have unwanted effects. Photobiomodulation is a technique to modulate inflammation, accelerate tissue repair, and also reduce pain and discomfort in different clinical situations, using low-level laser therapy and LED (light-emitting diode). Thus, the present study aims to carry out a Systematic Review of extraction in third molars with photobiomodulation, followed by a meta-analysis to assess cost-effectiveness. For the systematic review and meta-analysis, studies published between 2005 and 2020 will be selected. Searches will be conducted through the international databases PubMed, Web of Science, and MEDLINE. It will be used the search terms "third molar", "phototherapy"," dental extraction", "laser therapy", "third molar extraction", "photobiomodulation"," third mandibular molar", "third molar surgery", "low level laser therapy" and "wisdom tooth removal". The cost-effectiveness establishes whether or not a treatment should be implemented as a therapeutic measure, is calculated by the difference between the cost of two interventions proposed as treatment divided by the difference between its consequences (effectiveness). The costs will be based on the values with the treatment with the laser and with the use of anti-inflammatory, having as outcome measure pain (visual analog scale) and trismus (mouth opening-mm). This protocol is registered in PROSPERO CRD42018105658.

Notes:

Evaluation of the Photodynamic Effect Mediated by Methylene Blue in Surfactant Vehicle for the Adjuvant Treatment of Periodontal Disease: Randomized, Controlled, and Double-Blind Clinical Trial

Claudio Teruo Kassa*, Bianca Godoy-Miranda, Christiane Pavani, Renato A. Prates

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Periodontitis is an inflammatory disease that affects the supportive tissues of the teeth in response to the presence of microorganisms. The gold standard treatment is scaling and root planning. To reduce the use of antibiotics, antimicrobial photodynamic therapy has been studied as an adjunct in periodontal treatment. The main limitation of the technique is the formation of dimers that decrease the effectiveness of the photosensitizer, and sodium dodecyl sulfate has been shown to decrease dimerization. The aim of this study is to evaluate the photodynamic effect mediated by methylene blue in sodium dodecyl sulfate for the adjuvant treatment of periodontitis. This clinical trial will be performed with 40 participants, and all of them will receive scaling and root planning. After 40 days, photodynamic therapy with real irradiation or placebo irradiation will be applied. The random allocation will be in the following groups: 1) group treated with scaling and root planning and photodynamic therapy with methylene blue in sodium dodecyl sulfate; or 2) with photodynamic therapy with methylene blue; 3) and the group treated with root scraping and straightening associated with photosensitizer without light irradiation and 4) treated with a photosensitizer in sodium dodecyl sulfate without light irradiation. The photosensitizer will be in contact for 1 min and the irradiation time or not 2 min. The laser's wavelength will be 660 nm and 100 mW of power. The primary outcome will be microbial count, and secondary outcomes will be clinical probing depth, clinical attachment level, and bleeding on probing.

Notes:

Effect of Antimicrobial Photodynamic Therapy on Period onto Pathogen: *In-vitro* Study

Bianca Godoy Miranda*, Cláudio Kassa, Giuliana Anselmo, Adriana Rossi, Christiane Pavani and Renato A. Prates

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Periodontal disease is an inflammatory response to oral biofilm, and the treatment consists of scaling and root planing. As an adjunct to this treatment, antimicrobial photodynamic therapy (aPDT) has been used, and it consists of the use of photosensitizer (FS) and a light source for the formation of reactive oxygen species. Therefore, the study aimed to evaluate the use of aPDT in Aggregatibacter actinomycentecomitans, as well as the optimization of parameters. For this, A. actinomycentecomitans (ATCC 29523) was used, cultivated in microaerophilia for 48 h. Then, the experiments were carried out in triplicate, with 6 groups: 1) Control, without intervention 2) Light, which was only irradiated 3) FS, where only FS was used 4) PDT1, which was performed aPDT with irradiation of 1min 5) PDT3, PDT with 3 min irradiation and 6) PDT5, PDT with 5 min irradiation. Methylene blue (Sigma – Aldrich, USA) was used as a dye at the final concentration of 100 μM and irradiated with laser λ = 660nm (Photon Lase lll, DMC, São Carlos, Brazil) with a power of 100mW and a radiant exposure of 215 J / cm^2. After microbial growth, the cfu / mL count was performed, and the mean and standard deviation were performed. The control, light and FS groups showed 1x109cfu / mL, and a microbial reduction of 7 orders of magnitude was achieved after 5 min of irradiation. It is concluded that aPDT was effective in microbial inactivation of A. actinomycentecomitans *in Vitro*.

Notes:

Association of Photobiomodulation and Intralesional Injection of Coritcoid in the Pre and Postoperative of Keloid Surgery: Double-Blind, Randomized Controlled Trial Protocol

Jefferson André Pires*, Raquel Agnelli Mesquita Ferrari, Sandra Kalil Bussadori, Anna Carolina RattoTempestini Horliana, Erick Frank Bragato, Marcos Momolli and Kristianne Porta Santos Fernandes

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Keloids are fibroproliferative scar, difficult to treat and with high taxes of recurrence after treatments. The keloids etiopathogenesis is related to the disordered fibroblasts growth and an increase of the transforming growth factor-beta (TGF-β) levels. The main intervention is the surgical removal associated with the injection of corticosteroids. The photobiomodulation (PBM) with blue light has demonstrated in In-Vitro studies on inhibition of fibroblasts and TGF-β levels. The present study is a randomized, controlled, and double-blind clinical trial which aim is to verify the effects of PBM associated with the corticoid treatment during the pre and postoperative periods of keloid removal (keloids of any part of the body sutured primarily after the surgery). Participants (N=38) will be randomly allocated into two groups named: (1)Sham group (N=19) submitted to the standard procedure (corticoid + removal surgery) and (2) PBM group (N=19) (PMB + Corticoid + removal surgery)using blue light (λ=470nm; P=400mW; E=24J, per point being 1 point per linear scar centimeter). The rate of recurrence and the quality of the new scars will be analyzed using the Vancouver scar scale. Silicone molds of keloids and new scars will be made and transposed in the acrylic surface to obtain measurements using optical coherence tomography. The histopathology of the resected keloid will also be analyzed to verify the fibroblasts, TGF-β, and collagen deposition and organization. Questionnaires (Qualifibro-UNIFESP and PSAQ) to assess the participant's quality of life and scar will be performed. The data will be submitted to statistical analysis.

Notes:

Does LEDs Conditioning Treatment Improve Mesenchymal Stem Cells Metabolism and Paracrine Effects?

Bárbara Sampaio Dias Martins Mansano[1*], Ighor Luiz Azevedo Teixeira[2], Rafael do Nascimento de Lima[1], JúliaBittencourt Dias[1], Nádia Coelho Dias[1], Paulo José Ferreira Tucci[2] and Andrey Jorge Serra[1,2]

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Myocardial Infarction is a major cause of morbidity and mortality worldwide. Mesenchymal stem cells (MSCs) are being studied due to the paracrine effects of secreted cytokines and growth factors that decrease inflammation and scar formation and increase local capillarity in infarcted myocardium. However, the loss of MSCs at the transplanted site is large. To address this problem, the use of light sources is a promising tool. In this study, we irradiated MSCs with LEDs, seeking positive changes in cell metabolism and enhancing cytokines and growth factors secretion to improve cardiac function later when transplanted into the infarcted heart. Adipocyte derived MSCs were obtained from Fischer-344 male rats (CEUA 5883160218), irradiated once every other day for a week with 630 nm LED box (Biolambda, Brazil) and analyzed the repercussion of different radiant exposures (0.5, 2 and 4 J/cm²). The Control group was kept in the dark for the same time as 4 J/cm²-placebo. Analyses were performed 24 hours after the last irradiation. None of the radiant exposures induced oxidative stress, DNA damage, or alterations in the levels of TNF-α. The 4 J/cm² irradiation up-regulated mitochondrial metabolism, ATP production, and IL-6, IGF-1, and NOx secretion. The 2 J/cm² had no significant action on the MSCs. Besides VEGF levels were significantly higher with 0.5 J/cm², a down-regulation in IL-10 level was detected. Thus, we concluded that the conditioning treatment with 4 J/cm² showed the best results in improving MSCs metabolism and secretion, being a good candidate to perform future cellular therapy in the infarcted myocardium.

Notes:

Effects of Antimicrobial Photodynamic Therapy (Apdt) in the Nasal Decolonization of Dialytic Chronic Renal Patients, *Staphylococcus Aureus* Carriers: A Controlled Blind Randomized Clinical Study

Daniella Teixeira Bezerra*, Alessandro Melo Deana, Benedito Jorge Pereira, Felipe Murakami Malaquias da Silva, Flávia Rossi, Kristianne Porta Santos Fernandes, Marcelo Jenne Mimica, Raquel Agnelli Mesquita Ferrari, Sandra Kalil Bussadori, Tânia OppidoSchalch and Anna Carolina RattoTempestini Horliana

UNINOVE – Nove de Julho University, Brazil

Infections are the leading cause of morbidity and mortality among patients with chronic kidney disease (CKD) on dialysis therapy. *Staphylococcus aureus* is a major agent, and previous nasal colonization represents an independent risk factor for infection. The nasal decolonization strategy reduces the infection rate in this population. The gold standard treatment is topical mupirocin, but there are reports of increasing bacterial resistance. Antimicrobial photodynamic therapy (aPDT) is a promising approach due to its potential bactericidal effect and low tendency to induce resistance.This controlled randomized, blinded, three-months follow-up clinical trial aims to compare the use of aPDT (□660nm, 400mW/cm2, 0.01% methylene blue) with mupirocin therapy in nasal decolonization among patients with CKD on dialysis therapy, through a semi-quantitative microbiological evaluation before and after intervention and recolonization time. Two groups G1- aPDT decolonization (n = 17) and G2- mupirocin treatment (n = 17) will be formed. Secretions from the anterior nasal cavities will be collected - at times T0 (before intervention- carrier status), T1 (first follow-up after intervention - decolonization effectiveness), T2, and T3 (at 1 and 3 months- recolonization). The samples will be sown in an anaerobic culture medium, and bacterial colonies will be identified by Mass Spectrometry - MALDI-TOF and tested for the antimicrobial sensitivity profile for Staphylococcus aureus(automated method Vitek 2). A questionnaire will be applied to identify possible factors related to colonization in this population. For statistical analysis: ANOVA two-way, complemented by the Bonferroni test. We expect treatments with aPDT and mupirocin to be equivalent.

Notes:

Effect of Photobiomodulation on Angiogenesis and Arteriogenesis in an Experimental Model of Lower Member Ischemia

Silvana Torres Perez*, Raquel Agnelli Mesquita-Ferrari, Sandra Kalil Bussadori, Anna Carolina RattoTempestini Horliana and Kristianne Porta Santos Fernandes

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Peripheral arterial occlusive disease (PAOD) is a late manifestation of atherosclerosis in the lower limbs due to a progressive decrease in blood supplying the tissues. Current treatments for PAOD are not so effective in the long term, and many patients progress to severe ischemia, running the risk of amputation. Photobiomodulation (PBM) has a proven effect on angiogenesis when using red and infrared sources. This project aims to evaluate the effect of PBM on angiogenesis (growth and proliferation of new blood vessels from existing vascular structures) and arteriogenesis (proliferation of pre-existing collateral arteries) using a lower limb ischemia model in rats. Visualization and measurement of the vessels will be performed via microscopy. 30 adult Wistar rats, under general anesthesia, will be submitted to thermography and oximetry of the hind legs, followed by surgical interruption of the femoral artery, causing ischemia. The animals will be divided into 2 groups (control and PBM). The control group will not receive any treatment. Irradiation with red (660 nm) and infrared (850 nm) laser, the total energy of 4 J / point every cm, will be applied 5x / week to the PBM group; the application will be along the femoral artery path, from the immediate postoperative period until the end of the experiment (30 days). Capillary density will be analyzed based on histological sections of the gastrocnemius muscle and measurement of collateral vessel density at 7, 14, and 30 days. The results will be treated statistically.

Notes:

Evaluation of Photobiomodulation in Salivary Glands in Patients with Xerostomy Induced by Anti-Hypertensive Drugs

Maria Lucia Zarvos Varellis*, Cícero Dayves Silva Bezerra, Felipe Gonçalves da Silva, Valdomiro F Barbosa Filho, Sandra Kalil Bussadori, and Alessandro M. Deana

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Arterial hypertension (SAH) is a systemic condition that affects about 30% of the world population, according to WHO. The drugs used to control it induces xerostomia, leading to reduction or absence of salivary flow, and consequently an increase in the index of caries, periodontal disease, loss of teeth, dysgeusia, dysphagia, poor digestion, impaired stability and retention of total and removable prostheses, in addition to bad breath and burning mouth syndrome. This work presents a blinded, placebo-controlled clinical protocol aiming to analyze the impact of photobiomodulation (PBM) on the salivary glands of patients with xerostomia induced by antihypertensive drugs. The patients were divided into 2 groups: G1:placebo PBM (n = 15); G2: adults with xerostomia induced by antihypertensive drugs and treatment with PBM (n = 25). The irradiation was performed with a diode laser device emitting at 808 nm, with 100 mW of power and 40 s of exposure time. Six sites were irradiated in the parotids, two in the submandibular (external) and two in the sublingual (internal), totaling 20 points. The patients were irradiated weekly for four weeks, and initial collections of stimulated and non-stimulated flow and final, following the same methodology, were performed. The initial and final volumes of stimulated and unstimulated saliva were analyzed. Our data show a significant increase in the salivary flow of the PBM group for both: non-stimulated and demonstrating the effectiveness of photobiomodulation in xerostomia induced by antihypertensive drugs.

Notes:

Photobiomodulation therapy associated with the use of carbon biomaterial impregnated with silver nanoparticles in the promotion of bone repair with infection control

Ayres Fernando Rodrigues*, Paulo Henrique Boulitreau Assirati, Marília Lucas Siena Del Bel, Patrícia de Almeida Mattos, Rodney Capp Palotta, Gabriela Ribeiro de Souza, Renato Prates and Rodrigo Labat Marcos

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Bone lesions are increasingly frequent in Brazil. Carbon materials, associated with silver nanoparticles, activated by photobiomodulation. They are promising in the treatment of infectious or aseptic bone failures.

The objective of this research is to evaluate the use of photobiomodulation associated with carbon material impregnated with nanosilver in the bone repair process in an experimental model of the bone lesion in the tibia of rats.

Wistar Rats (200-250g), 90 days of life, 120 animals will be used. The bone injury will be performed in the tibia, with a bone defect of 1.5 mm Ø x 0.5 mm deep (method proposed by Bossini).

Biochemical analyses (quantification of alkaline phosphatase, acid phosphatase-TR) - RT-PCR will be performed to quantify gene expression: BMP-4, BMP-7, RANKL, OPG, OCC, MMP; morphological analysis, with the preparation of histological slides; and functional analysis, with resistance tests (Fmax and Dmax). Followed by statistical analysis of the results.

Notes:

Photodynamic Therapy Efficiency and Scaling in Gingivitis Facilitated by the Use of Fixed Orthodontic Appliances: A Randomized Double-Blind Controlled Clinical Trial

Ellen Perim Rosa*, Felipe Murakami-Malaquias-Silva, Tânia Oppido Salch, Kristianne Porta Santos Fernandes, Raquel Agnelli Mesquita Ferrari, Sandra Kalil Bussadori, Lara Jansiski Motta and Anna Carolina Ratto Tempestini Horliana

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Corrective orthodontics is effective in recovering aesthetics and function; nonetheless, factors such as gingivitis contribute to its interruption. Orthodontic patients with gingivitis can be treated in the dental office with scraping; however, areas of gingival growth are difficult to access. Therefore, this study aims to test the effectiveness of antimicrobial photodynamic therapy (aPDT) as an adjunct in the decontamination of these areas. aPDT associates the use of a photosensitizer, light and oxygen to promote an antimicrobial effect. In this clinical, randomized, and double-blind trial, 34 participants in orthodontic treatment, presenting gingivitis and gingival growth, will be included, divided into 1. Control group- Ultrasound scraping + aPDT placebo and 2. Experimental group- Ultrasound scraping + aPDT. aPDT parameters will be: methylene blue 0.005%, λ = 660nm, 9J per site, irradiance = 3.5W/cm, radiant exposure = 318J/cm2. The analyzes will take place at baseline, 7 and 21 days after treatment. Clinical parameters will include a gingival index, plaque index, and probing depth. The crevicular fluid will be collected from 4 sites for analysis of IL-6 and IL-10 cytokines, by ELISA. The test for parametric data will be one-way ANOVA and for non-parametric Mann Whitney. Data will be presented by means ± SD and p defined at 0.05. The results of this study may present therapeutic alternatives. It is expected that there will be a decrease in IL-6 and an increase in IL-10, as well as an improvement in the clinical parameters of sites treated with aPDT and scaling.

Notes:

Photodynamic Therapy for Squamous Cell Carcinoma of the Head and Neck: A Systematic Review

Ana Melissa Ccopa Ibarra[1]*, Lara Jansinski Motta[1], Adriana dos Santos Lino[1], Daniela de Fátima Teixeira da Silva[1], Fabio Daumas Nunes[2] and Maria Fernanda Setúbal Destro Rodrigues[1]

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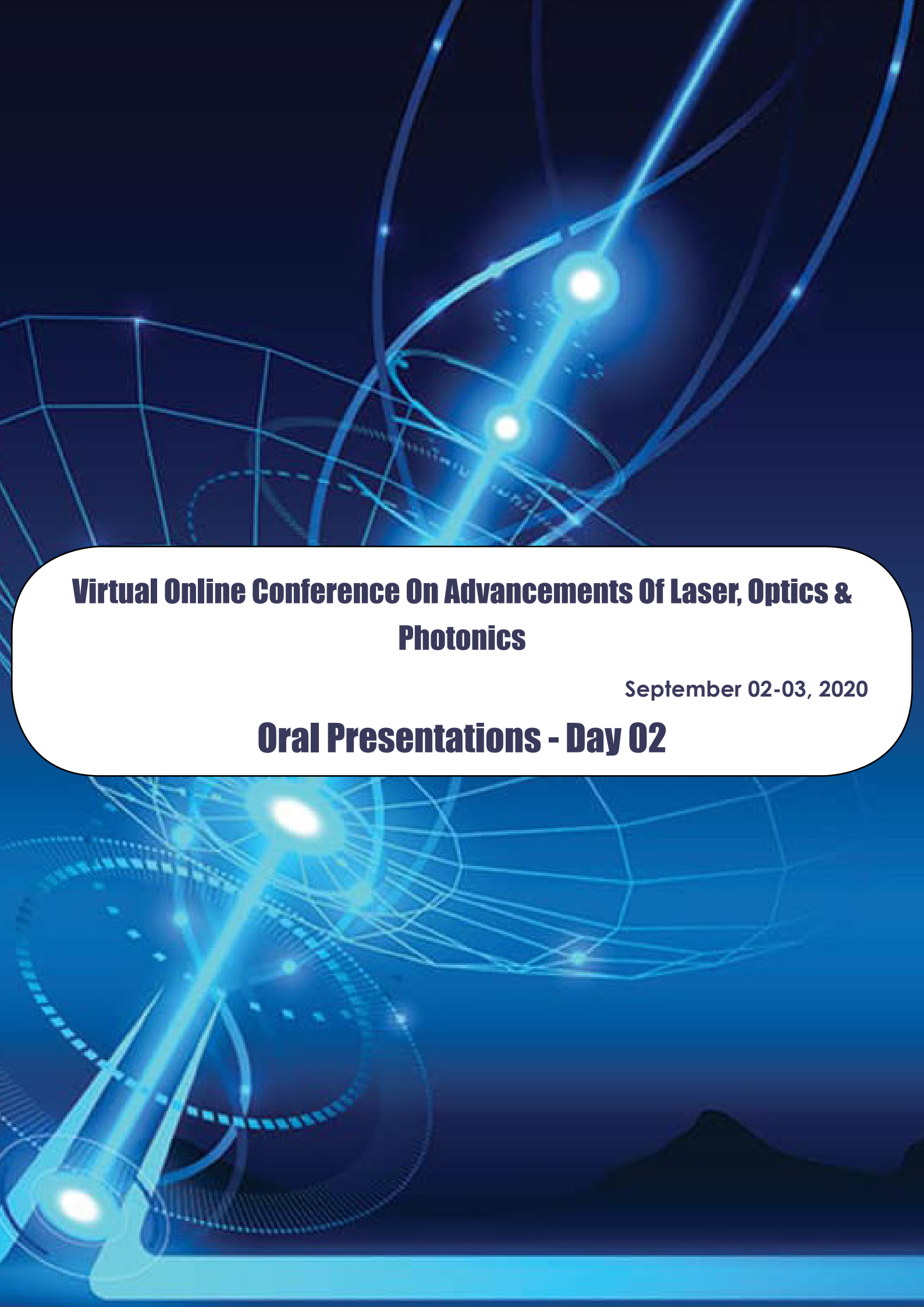
Squamous cell carcinoma of the head and neck (SCCHN) is a prevalent tumor worldwide. Approximately 30% of SCCHN are diagnosed at advanced stages of the disease and require radiotherapy associated or not with chemotherapy after surgical treatment. Despite the advances in treatment, the 5-year overall survival is still poor, and new therapies are desirable to improve prognosis as well as the quality of life. The present study aimed to review the literature regarding the effectiveness of photodynamic therapy (PDT) in SCCHN. The articles were systematically reviewed according to PRISMA statement, and the risk of bias was evaluated by JBI protocol. The literature search resulted in 34 included articles, a total of 1311 patients were treated with PDT, from which 983 patients were classified as early-stage or T1 – T2, 328 patients were classified as advanced orT3 – T4 tumors. The photosensitizers reported were mTHPC, porfimer sodium, 5-ALA, and Talaporfirin. The complete response to treatment ranged from 67-100% in early or T1 and T2 tumors and 12.5-70% in advanced or T3 and T4 tumors. Reported side effects were minimal, with rare cases of vocal cord adhesion and carotid blow in extensive laryngeal tumors. The current literature presents several study design limitations and a high risk of bias, as no study involved the use of the control group. PDT is a potential treatment tool for SCCHN. However, it is necessary to develop further robust clinical studies with longer follow up periods to establish its efficacy in SCCHN.

Notes:



Virtual Online Conference On Advancements Of Laser, Optics & Photonics

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Oral Presentations - Day 02

Laser cooling of the Yb^{3+}-doped YAG crystal

Biao Zhong
East China Normal University, China

Yb:YAG crystals have the properties of large absorption bandwidth, good mechanical and thermal properties. They are especially suitable for a laser gain materials of high power optical-pumped lasers. Crystals possessing excellent laser cooling properties are ideal gain medium candidates for future high power athermal lasers. Yb:YAG crystals which have been proved to have excellent laser cooling properties in theory are suitable for the athermal laser gain medium. However, the excellent laser cooling capacity of Yb:YAG crystals have not been fully proved experimentally. Utilizing a CW fiber laser, we demonstrate that the 3% Yb^{3+}-doped YAG single-crystal reaches its unprecedented cooling temperature limit of 225.3 K from the room temperature via the anti-Stokes fluorescence. The theoretical analysis based on the experimental results predicts that the cooling temperature limit of the 3% Yb^{3+}-doped YAG crystal can reach as low as 180 K, in particular, if one further purify the crystal and reduce its background absorption coefficient to $\alpha b = 1.0\times10^{-4}$ cm^{-1}, then the sample can be cooled to ~135 K at the wavelength of 1030 nm, which thus opening up a potential pathway to develop athermal laser of high power and the solid state optical refrigeration upon this most widely used laser material.

Biography

Biao Zhong joins East China Normal University as an Assistant Professor in the State Key Laboratory of Precision Spectroscopy. He received his BS in material physics from the Harbin University of Science and Technology in 2005, and his PhD in optics from East China Normal University in 2014. He is interested in cryogenic optical refrigeration in a rare-earth doped system, radiation balanced lasers, and laser materials. He is the author of more than 20 journal papers and conference proceedings.

High power/energy optics

Victor V. Apollonov
Prokhorov General Physics Institute, Russia

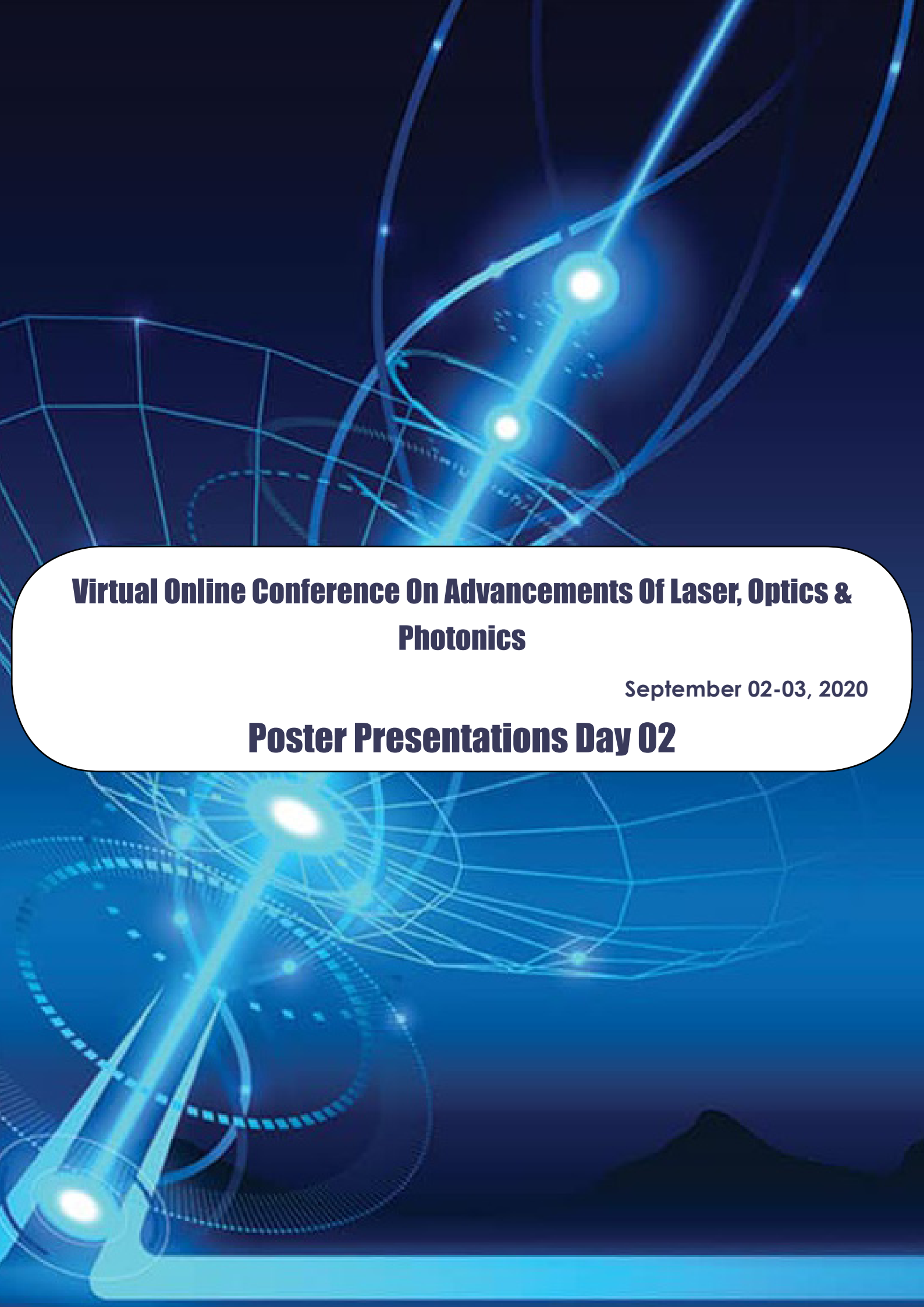
The advent of the laser has placed stringent requirements on the fabrication, performance and quality of optical elements employed within systems for most practical applications. Their high power performance is generally governed by three distinct steps, firstly the absorption of incident optical radiation (governed primarily by various absorption mechanisms); secondly, followed by a temperature increase and response governed primarily by thermal properties and finally the elements thermo-optical and thermo-mechanical response, e.g., distortion, stress birefringence fracture, etc. All of which needs to be understood in the design of efficient, compact, reliable and useful for many applications high power/energy systems, under a variety of operating conditions, pulsed, continuous wave, rep-rated or burst mode of varying duty cycles which is the most important for the wide spectrum of applications. LD array and matrix, disk laser geometry are the most important applications for this advanced technology. Due to the efficient porous cooling technology and the possibility of amplified spontaneous emission suppression the operation of the big size mono-module disk laser geometry is possible in CW and pulse-periodic modes at an extremely high output energy/power. The most important historical steps of high power/energy optics development will be presented in the talk. Analysis of a wide range of materials for high power/energy optics on the basis of stability parameters has shown that silicon carbide produced either by reaction bonding or sublimation has an advantage over other materials in all well-known criteria. Some new areas of SiC technology implementation will be presented as well. New challenges for contemporary investigations and new areas of application for high power/energy optics technology and ideas will be highlighted.

Biography

Apollonov V.V. is the leading specialist in the area of basic principles of creation and development of high power/energy laser systems and high power /energy radiation interaction with a matter. He has made an outstanding input into creation and development of new branches of science - physical and technical fundamentals of high power/energy laser optics and adaptive optics, investigation of physical processes in a high volume self-controlled discharges, creation of high power/energy continuous wave, pulsed and high repetition rate pulse-periodic laser systems, high power/energy lasers radiation interaction with matter, application of high power/energy lasers for effective protection of valuable objects and water surface cleaning, medical applications. Recent results of his investigations of laser diode arrays phase-locking, mechanisms of shock waves merging for a rockets launch by high repetition rate pulse-periodic laser light and super long conductive channel based on dust plasma by ablation are under very intensive implementation in our country and abroad. He is the author of more than 1000 publications and patents.

Apollonov V.V. is a high profile scientist and well known around all over the world, for more than 50 years of his international scientific activity, he has participated and organized more than 60 international conferences, symposiums, and workshops, prepared 34 candidates and doctors of physics and mathematics.

Apollonov V.V. is a member of European and American Physical Society, SPIE, AIAA, American Society for QE, and a member of the specialized scientific council of Russia. He is a full member of Russian Academy of Natural Science, Academy of Engineering Sciences and Academy of Military science, laureate of State prize of USSR (1982), of Russia (2001) and International prize ECOWORLD-2017.



Virtual Online Conference On Advancements Of Laser, Optics & Photonics

September 02-03, 2020

Poster Presentations Day 02

Cellular Quantum Entanglement Oscillations

Vahideh Tahmoorian Askari Boroojerdi
Tabriz University, Tabriz, Iran

Entanglement is a key feature in quantum information theory. Recently, quantum mechanics in biological systems have attracted lots of attention. A major interest is towards brain science. It is hypothesized that reality comes from the wave function collapse (Tuszynski, n.d.). So they believe that classical reality arises from brain cell's decoherence. The introduction of quantum coherence in brain cells can probably open up a new window to the brain functionality as a quantum computer. It should be noted that many quantum features are destroyed in a large, warm, wet, noisy environment. Therefore it seems that quantum effects don't survive in vivo. On the other hand, it is proved that brain cell's mitochondria can emit biophotons (Rahnama et al., 2011). Microtubules are composed of tubulin dimers to form cytoskeletons of the cell. Bose et al. show that irrespective of the temperature of the field, for a thermal state of a cavity field, the entanglement can arise. In this paper, the quantum entanglement between cellular biophotons and tubulin states is investigated. It is theoretically observed that some entanglement oscillations occur near the microtubule. We use thermal states to present and explain the oscillations. When it comes to the transfer of information in the brain, these oscillations may play an essential role.

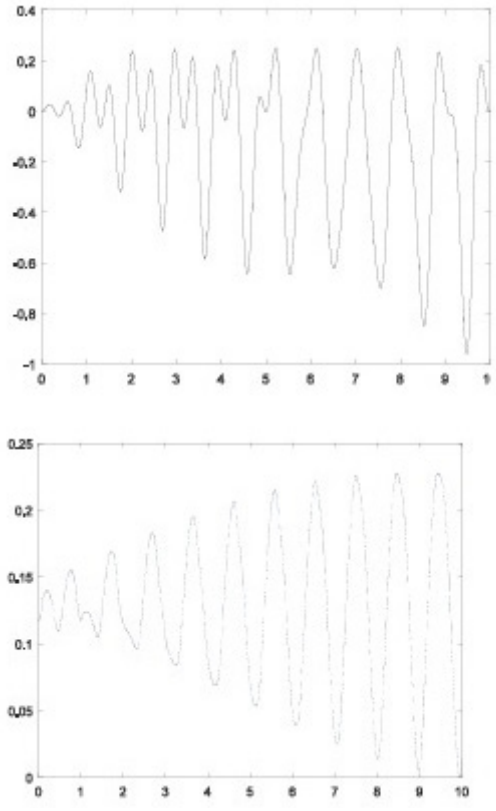


Fig.1 . Plot of negativity measure for n=10 number of biophotons.

Fig.2. The entanglement dynamics between cellular biophotons and tubulin dimers, n=10.

Treatment of Herpes Simplex Labialis with antimicrobial Photodynamic Therapy: Prospective, Randomized and Double-Blind Clinical Trial with 12 Months Follow Up

Andreia La Selva*, Renata Matalon Negreiros, Daniela Teixeira Bezerra, Ellen Perim Rosa, Renato Araújo Prates, Lara Jansisiki Motta,Sandra Kalil Bussadori, Kristianne Porta Santos Fernandes, Paulo Braz-Silva and Anna Carolina Ratto Tempestini Horliana

UNINOVE – Nove de Julho University, Brazil

The labialis infections by Herpes Simplex Virus type 1(HSV-1) are contagious and cause discomfort and pain, in addition to being recurrent. The gold standard treatment is Acyclovir, but there is viral resistance and does not prevent a recurrence. Antimicrobial photodynamic therapy (aPDT) is a promising approach because, in addition to its excellent topical antiviral effect, it does not induce resistance and prevents recurrence, according to some case reports. This controlled, randomized, double-blind, twelve-month follow-up clinical trial aims to compare the use of aPDT (660nm, 100mW, 120J/cm^2, 0.005% methylene blue) with topical Acyclovir therapy in the treatment of herpetic lesions in stages of vesicles and ulcers through the evaluation of the time to resolve the lesion. Two groups: G1- experimental group- aPDT and Acyclovir placebo (n= 12) and G2- Control group- Acyclovir treatment and aPDT placebo (n= 12) will be formed. Secondary variables are pain (visual analogic scale), analysis of cytokines by ELISA (IL1β, IL-6, TNF-α, IL, 10), quantification of HSV-1 by RT-qPCR, and recurrence. The lesions will be evaluated on 3rd and 7th days after the proposed treatment (treatment effectiveness). Follow-up in month 1, 6 and 12 after intervention (recurrence assessment). A questionnaire will assess the impact of oral health on the participants' quality of life (ohip-14), on the first day and after one year of care. For statistical analysis: ANOVA two-way, complemented by the Bonferroni test. We expect a shorter interval of time for the remission of the disease, without recurrence of the lesion at the site where aPDT was applied.

Notes:

Efficacy of Photodynamic Therapy for Pericoronitis Treatment: A Controlled, Randomized, Double-Blind Clinical Trial

Tânia Oppido Schalch*, Renata Matalon Negreiros, Andreia La Selva, Daniella Teixeira Bezerra,Sandra Kalil Bussadori, Lara Jansiski Motta, Raquel Agnelli Mesquita Ferrari,Kristianne Porta Santos Fernandes and Anna Carolina Ratto Tempestini Horliana

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Pericoronitis is a prevalent condition during the eruption of third molars, many times debilitating. The most indicated treatment (initial phase) is the irrigation. There is no adequate treatment at this phase, and evolution of disease may require antibiotic therapy. To reduce systemic dissemination of infection and antibiotics use, it is important to test the efficiency of treatments in the initial phase of pericoronitis. Antimicrobial photodynamic therapy (aPDT) is an interesting alternative because it is easy to perform and does not cause bacterial resistance. The aim of this study is to evaluate the effectiveness of aPDT in pericoronitis in its initial phase. In this controlled clinical trial, 34 healthy young individuals with pericoronitis will be randomized into the positive control group (n = 17): irrigation with sterile saline and aPDT (methylene blue-MB, 0.005%, $\lambda = 660$ nm , 9J per point, 318 J/cm^2) and experimental group (n = 17): treatment identical to G1, however, MB will be delivered in a new formulation for oral use. Microbiological quantification will be performed for Tannarella forsythia by PCRq. Saliva and gingival crevicular fluid will be collected to evaluate cytokines. Also, it will be analyzed the pain, edema, and buccal opening and the impact of oral health on quality of life. The variables will be evaluated in the baseline and 4th day after aPDT. For statistical analysis: ANOVA two-way, complemented by the Bonferroni test. We expect that aPDT will improve clinical parameters and reduce the amount of T.forsythia.

Notes:

Photobiomodulation and Orthodontic Movement of Molar Verticalization: A Randomized Double-Blind Study

Felipe Murakami Malaquias da Silva*, Ellen Perim Rosa do Nascimento, Andreia La Selva Almeida, Aguinaldo Silva Garcez Segundo, Marcella Ueda R Fernandes, Ricardo Fidos Horliana, Lara Jansisk Motta Godinho, Sandra Kalil Bussadori, Kristianne Porta Santos Fernandes and Anna Carolina Ratto Tempestini Horliana

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With the loss of teeth, the adjacent tooth moves towards the space left, causes aesthetic and functional problems. The skeletal anchoring system, as mini-implant (MI), has been increasingly used to replace the adjacent tooth to the correct place. Some photobiomodulation (PBM) protocols have been shown to accelerate orthodontic movements, with analgesia and inflammatory modulation. This study will evaluate how PBM interferes with molars verticalization movement, pain, and periodontium's inflammation. A selection of 34 patients with an inclined molar were randomly divided into 2 groups: G1 - verticalization with MI + PBM simulation; G2 - verticalization with MI + PBM. The PBM protocol will be: power of 100 mW, λ 808 nm, 1J per point, 10 points, for 10s, radiant exposure of 25 J / cm². Each 30 days, an orthodontic force will be applied, and PBM will be done at 0, 3, and 7 days, every month, for 3 months. By ELISA, the cytokines IL1β, IL-6, IL-8, IL-10, and TNF-α from the crevicular gingival fluid will be analyzed. We will use an initial and final panoramic radiography to measure the tilt speed. A Visual Analogue Scale and a count of painkillers will be used to assess the laser's analog effect. OHIP-14 questionnaire will be applied to identify the impact of oral health on the participant's quality of life. The ANOVA-one way test will be applied, with a mean ± SD and p-value <0.05. We expected an increase at inclination speed, a decrease in the amount of inflammatory cytokines, and an increase in anti-inflammatory.

Notes:

Comparison between Two Frequencies of Application of Photobiomodulation in Facial Rejuvenation

Erick Frank Bragato*, Raquel Agnelli Mesquita-Ferrari, Sandra Kalil Bussadori, Christiane Pavani, Marcos Momolli, Jefferson André Pires and Kristianne Porta Santos Fernandes

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Skin aging is an irreversible, slow, and progressive process, being mainly influenced by age, but also by external factors, such as ultraviolet radiation, smoking, alcohol, among others. Studies have shown the benefits of photobiomodulation (PBM) for facial rejuvenation, especially with the use of the red LED. However, there is still a high level of variability in the treatment parameters and the frequency of application of FBM. The purpose of this study is to compare the effects of PBM with LED mask (660nm, 6.4 mW/cm², 2.67 J/cm²) on facial rejuvenation using 2 application frequencies: one group will receive 2 applications a week for 4 weeks, and the other group will receive 3 applications a week for the same period. After 30 and 90 days, the depth and length of the wrinkles (evaluation of facial impressions by optical coherence tomography); the viscoelasticity of the skin; the evaluations of photographic images by experts (Wrinkle Assessment Scale) and the level of satisfaction of the participants (FACE-Q) will be compared with the data collected before the beginning of the study. All data will be analyzed statistically according to their distribution, seeking a level of statistical significance of 5%.

Notes:

Validation of the Reliability of the Optical Fluorescence Method for the Diagnosis of Dental Biofilm in Young Permanent Molars: A Randomized Controlled Clinical Trial

Juliana Terra Fernandes*, Aretusa Cardoso, Sandra Kalil Bussadori, Anna Carolina Ratto Tempestini Horliana, Raquel Agnelli Mesquita-Ferrari, Kristianne Santos Porta Fernandes and Lara Jansiski Motta

UNINOVE – Nove de Julho University, Brazil

Dental Caries disease is controlled through biofilm control, which balances demineralization and remineralization reactions, considering individual factors to prevent a recurrence. However, there are still few studies that make it possible to systematize a new protocol for the evaluation of dental biofilm through the use of light for the implantation of new biofilm control protocols through the use of optical fluorescence diagnosis. Fluorescence appears clearly in the plaque in red tones, showing the presence of microorganisms in regions where there is biofilm accumulation.

Objectives: To evaluate the applicability and effectiveness of the diagnosis of oral biofilm with the optical fluorescence technique using the EVINCE (LED with emission centered at 400 ± 10nm - MMOptics, Brazil) equipment and to create a clinical evaluation protocol for the presence of biofilm using the same equipment. Furthermore, we intend to compare the efficacy of the optical fluorescence diagnostic method with the traditional method (Fuchsin-based dye biofilm) and to observe whether EVINCE alone would be sufficient for the evaluation of dental biofilm in young people with mixed dentition without use of traditional dyes.

Methods: Children (6 to 12 years) will be evaluated by 3 different professionals, starting the evaluation where the 1st evaluator will note the IHOS observing only with EVINCE. In the second stage, a 2nd evaluator will perform the traditional disclosure technique with Fucsina, later noting the IHOS, and finally, 3rd evaluators who will observe with EVINCE the teeth previously stained in stage 2. We expect to find advantages with EVINCE.

This study was financed in party by the "Coordenação de aperfeiçoamento de pessoal de Nível superior-Brasil (Capes) –Finance Code 001"

Notes:

Effect of Photobiomodulation on Vulvovaginal Atrophy in Women in Post-Menopause: A Randomized and Controlled Trial

Marina Bertoni Guerra*, Marcos Momolli and Ana Paula Ligeiro de Oliveira

UNINOVE – Nove de Julho University, Brazil

Menopause is a physiological event and is defined as the loss of ovarian follicular activity, with the consequent permanent cessation of menstrual cycles. Its diagnosis is made retrospectively after 12 months of amenorrhea, with no pathological cause involved. This period is marked by several changes in the female organism, mainly the genitourinary syndrome (GUS), which is a collection of signs and symptoms resulting from the state of hypoestrogenism. Almost half of the postmenopausal women will experience symptoms of GUS, with vaginal dryness being the most prevalent, followed by dyspareunia and vulvovaginal irritation. The aim of the study is to evaluate the effect of photobiomodulation with red LED (light-emitting diode) on the symptoms of vulvovaginal atrophy in postmenopausal women. A randomized and controlled clinical trial will be developed, which will include postmenopausal women with signs and symptoms of vulvovaginal atrophy. Participants will be allocated into two groups: those who will undergo photobiomodulation with intravaginal LED, and those who will receive vaginal cream with estriol. Objective and subjective improvement of atrophy will be assessed using the Vaginal Health Index and the visual analog scale, respectively. Vaginal pH, cell maturation index, and changes in sexual function through the Female Sexual Function Index questionnaire will also be assessed. The variables will be analyzed at the time of admission, in one and three months after the intervention.

Notes:

Evaluation of the effects of high powered laser and electrocautery in lingual frenotomy surgeries in infants - blind randomized controlled clinical study

Adriana Cátia Mazzoni*, Kristianne Porta Santos Fernandes, Anna Carolina, Rato, Raquel Agnelli Mesquita-Ferrari, Lara Jansinski Motta, Pamella de, Barros Motta, Tamiris Silva, Ricardo Navarro and Sandra Kalil Bussadori

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Ankyloglossia is an anomaly that is characterized by an abnormally short or thick lingual frenulum that can restrict the movements of the tongue and has been identified as one of the factors that can negatively interfere with breastfeeding, decreasing the ability of the newborn to handle proper. The repositioning of the lingual frenulum, also called lingual frenotomy, is the most recommended for infants because it is a less invasive technique. This surgery can be performed conventionally with a scalpel blade or with thermal resources such as an electric scalpel or high-powered lasers.

Participants in this study will be infants between 0 to 3 months of age diagnosed with ankyloglossia, difficulties during breastfeeding, need for lingual frenotomy and will be randomly distributed into groups and divided into groups: Surgery group with electrocautery and Laser surgery group high power diode.

The objective of the study will be to evaluate the release of the lingual frenulum through the lingual frenotomy performed with a high power diode laser or electrocautery techniques.

Notes:

Photobiomodulation Modulates IL-6 and TNF- α expression during the Compensatory Hypertrophy Process in Skeletal Muscle

Andréia Martinelli de Siqueira Araujo[1*], Lucas Andreo[2], Agnelo neves Alves[2], Stella Mares Lins Terena[2], Kristianne Porta Santos Fernandes[2], SandraKalil Bussadori[1,2] and Raquel Agnelli Mesquita Ferrari[1,2]

[1]Postgraduate Program in Rehabilitation Sciences and

[2]Postgraduate Program in Biophotonics Applied to Health Sciences, UNINOVE – Nove de Julho University, Brazil

Skeletal muscle is a tissue with high adaptive capacity altering its characteristics to meet its diverse functional demands. Compensatory hypertrophy (CH) occurs due to excessive mechanical load on a muscle, promoting an increase in the size of muscle fibers. Photobiomodulation (PBM) has demonstrated beneficial effects on muscle tissue during CH. This study aimed to evaluate the effect of PBM on the inflammatory cytokines interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α) during the process of CH. Wistar rats were divided into three groups: Control Group (n=5), Hypertrophy (H) group (n = 10) and Hypertrophy + PBM group (n = 10). CH was induced through the ablation of synergist muscles of the plantaris muscle. The preserved plantaris muscle below the removed muscles was submitted to excessive functional load. PBM was performed with low-level laser (AsGaAl, λ = 780 nm; 40 mW; energy density:10 J/cm²; 10 seconds on each point, 8 points; 3.2 J). Animals were euthanized after 7 and 14 days. The plantaris muscles were removed and sent for analysis of the gene expression of IL-6 and TNF-α using qPCR. The gene expression results demonstrated an increase in IL-6 in the H+PBM group in comparison to the H group at 14 days as well as an increase in TNF-α in the H+PBM group in comparison to the H group at seven days. Based on findings in the present study, it is concluded that PBM was able to modulate pro-inflammatory cytokines that are essential for the compensatory hypertrophy process.

Notes:

In Vitro Study of COPD Caused by Smoking: Effect of Photobiomodulation Associated with Mesenchymal Stem Cells on the Release of Inflammatory Mediators

Soares S*, Brito A, Nascimento C, Santos T, Herculano K, Lino A, Fernandes K, Aimbire F and Ligeiro-Oliveira AP

UNINOVE – Nove de Julho University, Brazil

Chronic obstructive pulmonary disease (COPD) is characterized by chronic inflammation and alveolar enlargement. Several experimental models have been proposed for the discovery of new therapeutic options. Thus, mesenchymal stem cells (MSCs) and photobiomodulation (PBM) have been studied for their immune system modulating functions. The aim of this study was to investigate the effects of PBM associated with deciduous tooth MSCs on inflammatory mediators in bronchial epithelial cells (BEAS) induced by cigarette smoke extract (CSE). Human bronchial epithelial cells (BEAS-2B) were cultured ($5x10^4$ cells / well) and after 24 hours, the cells were incubated with CSE. 1 hour later irradiated with 808nm, 30mW, 60 seconds / well diode laser and / or MSCs extracted from tooth pulp, cultivated and characterized by the presence of $CD90^+$, $CD73^+$, and absence of CD34. After 24 hours, the supernatant was collected and the mediators were dosed. The effects of the association of PBM with MSCs on the release of cytokines (IL-6, IL-10 and IFN-γ) were evaluated by ELISA.

Results: CSE increased levels of IFN- γ($p<0.001$), decreased levels of IL-10 ($p<0.001$), did not change levels of cytokines of IL-6. Groups treated with MSCs showed an increase compared to the other groups ($p<0.001$). There was a significant decrease in IFN-γ ($p<0.001$), and an increase in the IL-10 ($p <0.001$) in the treated groups. In vitro treatment with MSCs and PBMs of CSE treated cells can be promising on the effects of the 808nm laser in the treatment of patients with COPD.

Notes:

Transcutaneous Systemic Photobiomodulation Ameliorates the Lung Inflammation Induced by Sepsis

Paula Tatiane Alonso*, Rodrigo Labat Marcos, Daniela de Fátima Teixeira da Silva, Maria Fernanda de Souza Setubal Destro and Adriana Lino-dos-Santos-Franco

UNINOVE – Nove de Julho University, Brazil

Sepsis is a severe disease with high mortality index. Acute lung injury (ALI), characterized by alveolar damage, lung inflammation, and impaired gas exchange, is a serious manifestation of sepsis, which is not efficiently treated by current drugs. ALI is pathology with high morbidity and mortality. Photobiomodulation (PBM) has been showing good results for several inflammatory diseases. The aim of this study was to analyze the effect of systemic PBM with a red LED in the management of inflammatory parameters. Male rats were injected with lipopolysaccharide (LPS) or saline (i.p.) and, irradiated or not with light-emitting diode in the caudal vein, for 150 s, 2 and 6 h after the LPS injections. After 24 h the LPS or saline injections, the inflammatory parameters were investigated. Device specifications: Bio Lambda LEDstar, Black Box Mini Model, São Paulo, Brazil; Probe Design, Single Probe; Wavelength: 660 nm; Radiant Power: 160 mW; Power Density: 38,5 mW/cm^2; spot area: 4,15 cm^2; Density of energy: 5,8 J/cm^2; Issuance: Continuous (cw); Total Radiant Emission: 24 J. Our results point to the beneficial effects of systemic PBM on the LPS-induced ALI, as it reduced the number of neutrophils recruited into BAL, myeloperoxidase activity and also reduced IL-1β, IL- 6 and IL-17 in the lung. Our data showed beneficial effects of transcutaneous systemic PBM treatment on ALI caused by sepsis, and suggest that PBM application as an inexpensive and non-invasive additional treatment to sepsis.

Financial support: *CNPq 305099/2017-5.*

Notes:

Effects of Photobiomodulation Preconditioning in Third Molar Surgeries

Erika da Silva Mello*, Sandra Kalil Bussadori, Rafaela Neves de Souza Santos, Marta Cristina Dantas dos Santos, Letícia Viana dos Santos, Kristianne Porta Santos Fernandes and Alessandro de Melo Deana

UNINOVE – Nove de Julho University, Brazil

Preconditioning the tissue offers good results in preventing mucositis in cancer treatments and in preventing muscle injuries in fatigue protocols. On the other hand, in third molar surgeries, photobiomodulation has been widely used in the treatment of postoperative complications such as pain, edema, and trismus. This study aims to evaluate the effects of photobiomodulation preconditioning in third molar surgeries. This is a clinical, randomized, double-blind, and placebo-controlled study. Adults over 18 years old, with an indication of removal of third molars, compatible with the inclusion criteria, after signing the Informed Consent Term, their facial and interincisal measurements were measured. They received treatment according to randomization (treatment group-TG / control group-CG), and after one hour, they underwent removal of the third molar. After 48h and 7 days, measurements were taken, pain analysis according to a visual analog scale and randomized treatment. At the conference, we will present the preliminary results of this clinical trial.

Notes:

Photobiomodulation Effect on the Production of Cytokines Used in Oral Lichen Planus Pathogenesis

Eloiza Helena Da Silva Brandão[1*], Karen Roberta Lopes Cunha[1], Kaline da Silva Brito[1], Camila de Barros Gallo[2] and Maria Fernanda Setúbal Destro Rodrigues[1]

[1]UNINOVE – Nove de Julho University, Brazil

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Oral Lichen Planus (OLP) is a chronic mucocutaneous inflammatory autoimmune disease. The lesions may be asymptomatic or have severe pain. The standard treatment consists of using topical and systemic corticosteroids, which are associated with clinical improvement, although there may be side effects or a lack of response to the therapy. Photobiomodulation (FBM) is effective in the treatment of inflammatory diseases, reducing the release of inflammatory cytokines, promoting analgesic effect, and accelerating the repair process. There are no studies in the literature that evaluated the effects of FBM on the modulation of inflammatory cytokines in OLP. Thus, this work aims to evaluate the concentration of TNF-α, IL-17, IL-1β in the serum of patients with OLP, treated with FBM, when compared to conventional treatment. Patients diagnosed with OLP were randomized into two groups (control and FBM). The control group patients were treated with topical 0.05% clobetasol propionate, 3 times a day for 4 weeks, and with laser equipment off, twice a week. In the FBM group, the irradiation was performed twice a week with low power In GaAIP diode laser (680 ± 20nm, power 100mW, energy density 177J / cm 2, 5 seconds, 0.5J total energy per point) for 4 consecutive weeks and with a placebo gel, 3 times a day for 4 weeks to mask the treatment. Peripheral blood was collected at baseline (D0) and at the end of treatment (D30). After processing, the plasma will be aliquoted for the evaluation of cytokines by ELISA.

Notes:

Comparative Clinical Study of the Blue, Red and Combined LED in Inflammatory Acne

Mara Lúcia Gonçalves Diogo* and Lara Jansiski Motta

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Light therapies have been used in dermatoses, including acne. Some studies indicate that the blue LED inhibits the proliferation of C. bacterium acnes and that the red light acts to decrease the inflammatory condition. Several studies have been analyzed, some In-Vitro, others In-Vivo; however, few studies have compared and analyzed the In-Vivo use of LED in acne. Therefore, the objective of this study is to compare the effect of the blue LED, the red LED, and the combined red and blue LEDs in patients with mild and moderate inflammatory acne (grades II and III). 108 participants with inflammatory acne will be selected according to the classification of the Brazilian Society of Dermatology and IGA (Investigator's Global Severity Assessment) and also the degree of skin color according to the Fitzpatrick scale (I to IV). Participants will be treated with an LED mask, applied over the entire face, for 10 minutes, 3 times a week, in the UNINOVE laboratory, divided into 3 groups, where the first group will use a mask with blue LED, the second with LED red and the third with combined blue and red LED. The evaluations will be made through photos and counts of papules and pustules, in the baseline, on the 15th and 30th day of treatment by a blind evaluator. Participants will also assess their perception of improved appearance after the end of treatment, using the CADI questionnaire (CARDIFF ACNE DISABILITY INDEX).

Notes:

Title: Evaluation of the Influence of Culture Medium in the Effect Antimicrobial Blue Light Therapy on Periodontopathogens

Luciana T. C. Salviatto*, Renato Araujo Prates, Bianca Godoy-Miranda, Sara Raquel S. Silva, Jean Abdias L. dos Santos and Alessandro Melo Deana

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Periodontal disease (PD) is a chronic inflammatory disease caused by bacterial biofilm which is highly prevalent worldwide. Antimicrobial photodynamic therapy (aPDT) has been used as a complement to the conventional treatment and aims at the production of reactive oxygen species (ROS) using light and an exogenous photosensitizer to eliminate microorganisms. On the other hand, antimicrobial blue light therapy (aBLT) takes advantage of endogenous photosensitizers (such as protoporphyrin and flavin). The objective of the present study is to evaluate the potential for the bacterial kill by aBLT and the influence of the culture medium in the death rate of Aggregatibacter actninomycetencomitans and Porphyromonas gingivalis. The protocol used will be the use of a 403nm ± 15 LED (blue / violet) with a power of 1W, the irradiance of 588, 2 mW / cm2, for 0, 1, 5 and 10 min of irradiation exposure. Four groups are being studied: A. actinomycetencomitans cultivated in BHI; P. gingivalis grew in BHI; A. actinomycetencomitans grown in blood agar, and P. gingivalis grown in blood agar. The plates will be incubated in microaerophy and anaerobiosis, in a bacteriological greenhouse, with a temperature regulated at 37^{o} C during a period of 48h to count the colony-forming units (CFU / mL) and performed in triplicate. The comet test will be carried out on the culture of microorganisms after irradiation to assess the possible DNA damage generated by antimicrobial therapy with the blue light. At the conference, we will present the first results of this work.

Notes:

Effect of Apical Periodontitis in Experimental Asthma Model

Juliana Ricci P. de B. Hironaka*, Karina Brajato, Veridiana Delle and Ana Paula Ligeiro de Oliveira

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Apical periodontitis is caused by pulpal necrosis, with consequent inflammation and destruction of the periapical tissues. It has been shown that periodontal disease can influence the symptoms of Asthma. Asthma is a chronic inflammatory disease characterized by lower airway hyper responsibility and variable airflow limitation. To date, there are few papers correlating the symptoms of Asthma in patients with apical periodontitis (AP).This study aims to evaluate the effect of photodynamic therapy with endodontic treatment on pulmonary inflammation in an experimental model of Asthma. Forty-eight male Balb/c mice were divided into 6 groups (n = 8). Basal, AP, AP + PDT, Asthma, Asthma + AP, Asthma + AP + PDT. Apical periodontitis was induced with the coronary opening, and the tooth remained open for 21 days. Asthma was induced by ovalbumin (OVA) and aluminum hydroxide, subcutaneously (days 0 and 14) challenge via tracheal oro, three times a week for six weeks. The treatment of PA was performed with calcium hydroxide and PDT with methylene blue (0.005%) associated with red diode laser irradiated 660 nm, with the energy of 287 J / cm2, with 9 J at the point, delivered in 90 s. Total and differential counts of alveolar bronchial lavage (BAL) and serum alkaline phosphatase were analyzed after euthanasia. We observed an increase of lymphocytes and eosinophils of BAL in the Asthma+AP group when compared to the Asthma group. On the other hand, we observed a reduction of this cell recovered from the BAL in the Asthma+AP+PDT group about the Asthma+AP group. In addition, there was an increase in bone resorption (alkaline phosphatase) in the AP and Asthma+AP groups, but with the treatments, only the non-asthma groups reduced this parameter. It is concluded that apical periodontitis may increase pulmonary inflammation. The association of Asthma with apical periodontitis worsens the parameters of pulmonary inflammation. However, after the standard treatment with PDT of apical periodontitis, pulmonary inflammation decreased in the asthmatic mice, reaching near the basal levels.

Notes:

Photobiomodulation Treatment Ameliorates Allergic Lung Disease Mediated by Reduced Mast Cell Degranulation

Simone Klein*, Daniel Lopes de Souza, Lohana Rocha, Rodrigo Labat Marcos, Daniela de Fátima Teixeira da Silva, Maria Fernanda de Souza Setubal Destro and Adriana Lino-dos-Santos-Franco

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Introduction: Since asthma is a multifactorial disease whose treatment sometimes is not effective, new therapies that improve the respiratory discomfort of patients are of great importance. Photobiomodulation (PBM) has emerged as an important toll to treat lung diseases characterized by inflammation. So our objective was to investigate the effects of PBM on allergic lung disease by an evaluation of lung cell migration, mucus secretion, tracheal responsiveness, and mast cell degranulation.

Methods: Male Balb/c mice were or not sensitized and challenged with ovalbumin (OVA) and treated or not with PBM (1h and 4 h after each OVA challenge). Analysis was performed 24h the last LED treatment or OVA challenge. Device specifications: Bio Lambda LEDstar, Black Box Mini Model, São Paulo, Brazil; Probe Design, Single Probe; Wavelength: 660 nm; Radiant Power: 160 mW; Power Density: 38,5 mW/cm2; spot area: 4,15 cm2; Density of energy: 5,8 J/cm2; Issuance: Continuous (cw); Total Radiant Emission: 24 J.

Results: Our results showed that PBM treatment in asthmatic mice reduced the lung cell infiltration, the mucus production, the tracheal's contractile response. The effects of PBM treatment on these parameters may be modulated by mast cells, since the degranulation was decreased ($P<0.05$).

Conclusions: This study may provide important information about the effects of PBM, and in addition, it may open the possibility of a new approach for the treatment of asthma.

Financial support: *CNPq 305099/2017-5.*

Notes:

Evaluation of the effects of Photobiomodulation on Pain, Edema, Paresthesia, and Bone Regeneration Following Surgical Maxillary Disjunction: Protocol for a Randomized Controlled Double-Blind Clinical Trial

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The proposed study aims to evaluate the efficacy of LED devices regarding the control of pain, edema, paresthesia, and bone repair following surgical maxillary disjunction. The secondary aims are to evaluate the degree of anxiety and the impact of the surgical procedure on quality of life. A randomized, controlled, double-blind clinical trial will be conducted with 72 patients. The procedures will be performed by Three surgeons. Two examiners blinded to the allocation of the patients to the different experimental groups will perform the preoperative and postoperative evaluations, and another researcher will administer PBM. Prior to each surgery, five facial measurements, a periapical radiographic exam, facial and oral sensitivity tests, and evaluation of anxiety (Beck questionnaire and determination of salivary IL-1β, IL-6, TNF-α, and cortisol) will be performed. Immediately after the surgeries, the participants will be randomly allocated to the active and sham PBM groups. In the active group, the participants will receive nine applications of PBM (immediate postoperative period, 1-120 days) with a facial device (57 LEDs at 660 nm and 74 at 850 nm, 5 mW; 6J per point) and an intraoral device (3 LEDs at 660 nm, 5 mW; 2J per point). In the sham group, irradiation will be simulated. Data will be collected in periods up to 120 days after surgery, depending on the variable analyzed. A normality test will be used to determine the appropriate statistical tests for each dataset, with the level of significance set to 5%.

Acknowledgments: *São Paulo Research Foundation (FAPESP)2019/03320-2*

Notes:

Effect of Photobiomodulation on Soft Tissue Traumatic Injuries: Double-Blind Randomized Controlled Clinical Trial

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Photobiomodulation (PBM) is indicated as an adjuvant treatment to accelerate wound healing, however, there is still a lack of evidence regarding its effect on traumatic soft tissue injuries. This project aims to evaluate the effects of PBM in the resolution of complex soft tissue injuries of traumatic origin associated with tibial fractures. 84 adult individuals, aged between 18 and 60 years, hospitalized with tibial fractures awaiting resolution of soft tissue injuries will be included to undergo definitive surgery. The subjects will be randomized in two groups: FBM (treated with a device with 144 LED emitting diodes at wavelengths of 420, 660 and 850nm, 3J per point for 10 minutes) and Sham (simulation of the LED application, with a device with characteristics identical to that of the PBM group, for the same period of time). Subjects will be treated daily until release for surgery. The primary outcome will be the assessment of the wound healing process using the Bates-Jensen scale. Secondary outcomes will be: pain intensity, consumption of analgesic drugs, serum evolution of inflammatory markers C-reactive protein and creatine kinase, measurement of the lesion area, the time needed for release for definitive surgery, presence of infection, and the effective effectiveness of PBM. The evaluations will be carried out before the beginning of the intervention and daily until the participant is considered ready for surgery (which will be considered the end of the experimental period). The data will be analyzed statistically, considering a significance level of 5%.

Notes:

Analysis of the Parameters of Er: YAG laser on the Surface Topography and Mechanical Properties of Zirconia

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With the increase in aesthetic requirements in Dentistry, alternatives were sought for the elimination of metallic structures. Ceramics are the materials of choice for dental prosthetic rehabilitation because they have many enviable properties. Among them are: aesthetics, abrasion resistance, biocompatibility, little plaque accumulation, low thermal conductivity, and color stability. Zirconia structures are widely used. However, the great disadvantage of zirconia is the low potential for adhesion to resin cement. Unlike conventional porcelains where the vitreous phase can be conditioned by hydrofluoric acid, creating mechanical retentions on the internal surface of the piece, zirconia has a high crystalline content without any vitreous phase at the edges of the 'crystalline organs.' Thus, it is inert to acid conditioning, and its wettability with the cementing (bonding) agent is impaired. In an attempt to increase the mechanical retention between zirconia and cement, some treatments are suggested by the literature: Sandblasting with aluminum oxide and high power lasers. Although there is much information about the effects of this irradiation on enamel and dentin, little is known about the irradiation of this laser as a surface treatment for high-strength dental ceramics. The aim of this work will be to compare the surface roughness and morphological characteristics of Zirconia ceramic surfaces irradiated with Er: YAG laser with the variation of radiant energy.

Notes:

Effect of Photobiomodulation and its Combination with Corticosteroid in an Experimental Model of Chronic Pulmonary Inflammation

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Asthma is characterized by chronic inflammation of the airways, reversible airflow obstruction, and airway hyperresponsiveness. A common treatment is performed with the use of a corticosteroid such as Fluticasone (FT). Photobiomodulation (PBM) is relatively new, inexpensive, with no side effects, and demonstrates effectiveness in reducing inflammatory parameters. We aimed to evaluate the effects of PBM and its combination with FT in asthma. The Balb/C mice were divided into groups: controls, FT, PBM, OVA, OVA+PBM, OVA+FT, and OVA+PBM+FT. We induced inflammation by sensitization with ovalbumin - OVA and orotracheal challenge from day 21. We treated with FT (100 μg/kg - intranasal) one hour before challenge with OVA, and one hour after the challenge, we applied PBM - laser diode (660nm, 30mW, and 3J/cm^2) at three distinct points. Twenty-four hours after the last treatment, the animals were anesthetized for the collection of bronchoalveolar lavage (BAL) and lungs. The data were submitted to the One-way ANOVA test, followed by the Newman-Keuls test. Significance levels adjusted to 5% ($p<0.05$). We observed a reduction in the total number of cells in BAL, in macrophages, with the best result in OVA+LLL, lymphocytes, with a greater reduction in the groups associated with the laser, neutrophils, and eosinophils. Reduction of production of cytokines IL-4, IL-5, IL-1β, TNF-α, and IL13, where the laser-treated groups showed better results, increased the level of the IL-10, presenting better results in the groups treated with FT. There was a reduction in collagen fiber deposition and mucus production in the airways.

Notes:

Photobiomodulation Associated with Fitoscar® in the Treatment of Fournier's Gangrene: Case Report

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Fournier's gangrene (FG) is necrotizing fasciitis of the perineum, abdominal wall, and genital regions of men and women. It is characterized by obliterating endarteritis with ischemia and thrombosis of the subcutaneous vessels with necrosis and bacterial infection. Surgical interventions accompanied by long periods of hospitalization along with coverings and dressings are the Treatment of choice for FG, making Treatment long and costly for the public health system. This study aims to present a case report on a patient with FG who underwent photobiomodulation (PBM) associated with secondary covering. Description: WOM, male, 49 years old, admitted to a public hospital in the state of São Paulo on 15 Oct. 2019 with a diagnosis of FG; emergency surgical debridement was performed accompanied by antibiotic therapy. The PBM was applied to wound with a cluster: 3 LEDs 460nm, P= 400Mw and 2 lasers 600nm, P= 100mW and 2 red LED emitters, 660nm P = 200mW; 60 seconds per points.

Secondary dressing with FITOSCAR® (extract of Stryphnodendron adstringens) was changed every 48 hours for the ten days of Treatment. The lesions were evaluated using the PUSH scale with the improvement of the border, secretion, and wound center. It was concluded that PBM associated with FITOSCAR® was satisfactory in the Treatment of FG, reducing hospitalization time as well as hospital costs.

Notes:

Photobiomodulation Reduces Lung Function in experimental Model of Asthma by Alters Nitric Oxide/Eicosanoids Relationship

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Asthma is a chronic inflammatory disease characterized by lung cell recruitment and airway hyperresponsiveness. Treatment consists of bronchodilator antagonists, corticosteroids, or leukotrienes. Photobiomodulation (PBM) appears as a possibility in the treatment of lung diseases, and we focus on evaluating the effects of PBM on lung function in the experimental model of asthma. Male wistar rats were sensitized or challenged with ovalbumin (OVA) and treated or not with PBM (1h and 4h after each challenge with OVA). After 24 h of the last challenge with OVA, lung function and levels and gene expression of nitrites and eicosanoids were evaluated. Wavelength: 660 nm; Power: 160 mW; Power density: 38.5 mW/cm2; Energy density: 5.8 J/cm2; Exposure time: 150 s; 24J energy;The irradiation was performed at a single point, reaching the trachea and lungs. The data showed that PBM in allergic rats caused reduced respiratory resistance (Rrs), respiratory elastance (Ers) to cholinergic stimuli. The effects appear to be dependent on the balance of nitric oxide and eicosanoids since we have demonstrated high levels of nitrites concomitantly with reduced levels of eicosanoids in lung explants. We have also shown increased nitric oxide synthase (NOS) gene expression and decreased gene expression of cyclooxygenase enzymes (COX1 and COX2) in lung tissue after treatment with PBM. The data presented show that treatment with PBM reduced respiratory mechanics during the allergic response, altering the nitric oxide/eicosanoids ratio and opening the possibilities of treating episodes of bronchoconstriction.

Notes:

Evaluation of Cellular Viability After Photodynamic Therapy in Oral Squamous Cell Carcinoma

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Introduction: Squamous cell carcinoma is the most prevalent malignant neoplasm in the oral cavity. The main therapeutic modalities of OSCC are surgery and radiotherapy alone or in combination with cisplatin. Photodynamic Therapy (PDT) is based on the use of photosensitizers, whose cytotoxicity is activated by light, leading to the death of target cells. Some studies have demonstrated that PDT can be an alternative treatment to OSCC in initial stages.

Objective: The aim of this study was to evaluate the effects of PDT on the cellular viability of OSCC cell lines using different dosimetric parameters.

Material and Methods: CA1 and Luc4 cell lines were cultivated in DMEMF12+10%FBS and supplements. 5x104 cells were plated in 96-well plates and divided into the following groups: control, LED, 5-aminolevulinic acid (5-ALA) and 5-ALA-PDT (5-ALA+LED). Cells in the 5-ALA and PDT groups were incubated with 0.5 mM; 0.75 mM e 1mM 5-ALA at 37ºC for 4h. Next, cells were washed, and the groups LED and PDT were irradiated with a diode emission light (LED) using the BioLambda LedBOX, 660nm, 3J/cm² or 6J/cm², 49.5 mW/cm² and 40% or 80% of power capacity. Cell viability was evaluated after 24h using the MTS and neutral Red assays.

Results: CA1 and Luc4 cell lines showed a significant decrease in cellular viability after 5-ALA-PDT with 6J/cm2, 5-ALA at 1mM, and 80% of the power. No difference in cell viability was observed with 3J/cm² or 6J/cm² and 40% and 80% of power in both cell lines. In addition, a significant decrease in neutral red incorporation was noticed in PDT groups (1mM 5-ALA, 6J/cm2, and 80% of power) from CA1 and Luc4 when compared to all groups.

Conclusion: PDT was able to decrease the cellular viability in OSCC cell lines, and further studies are needed to evaluate its effects on other biological processes in OSCC.

Notes:

Changes in Masticatory Muscle Activity in Children with Cerebral Palsy: Systematic Review Protocol

Rafael Zaratin Beltramin*, Monise Mendes Rocha, Anna Carolina Ratto Tempestini Horliana, Lara Jansiski Motta, Ana Luiza Cabrera Martimbianco, Elaine Marcílio Santos, Raquel Agnelli Mesquita Ferrari, Kristianne Porta Santos Fernandes and Sandra Kalil Bussadori

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The aim of this systematic review will be to analyze whether children with cerebral palsy (CP) have abnormal bilateral masseter and temporal muscle activation during mastication. This review will follow the recommendations of the Cochrane Handbook for Systematic Reviews of Interventions and PRISMA statement and will be registered at the PROSPERO platform. A comprehensive search of the literature will be performed using an electronic search (MEDLINE, Embase, Cochrane Library, LILACS, BBO, Clinicaltrials.gov, and WHO/ICTRP) with no restriction regarding date and language. The grey literature will also be screened via OpenGrey. We will include randomized (RCT) comparative observational studies that assessed as primary outcome masticatory muscles (temporal and masseter) activation, by using electromyography parameters such as time of activation, duration, masticatory cycle, and force peak. Two authors will independently select the references retrieved by search strategy using the software Rayyan and will extract the data from included studies. All discordance will be solved by a third author. The risk of bias assessment will be performed using the Newcastle-Ottawa scale. We will calculate the mean differences for continuous outcomes and risk ratios for dichotomous outcomes (CI 95%). If possible, electromyography parameters will be combined in a meta-analysis using the random-effect model in the Review Manager 5.4 software. Heterogeneity between studies will be evaluated. The certainty of the body of the evidence will be assessed using the GRADE approach.

Notes:

Effectiveness and Safety of Photobiomodulation for Treating Masticatory Muscle Spasticity in Children with Cerebral Palsy: Systematic Review Protocol

Monise Mendes Rocha*, Rafael Zaratin Beltramin, Anna Carolina Ratto Tempestini Horliana, Lara Jansiski Motta, Ana Luiza Cabrera Martimbianco, Elaine Marcílio Santos, Raquel Agnelli Mesquita Ferrari, Kristianne Porta Santos Fernandes and Sandra Kalil Bussadori

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The aim of this systematic review will be to evaluate the effects (benefits and harms) of photobiomodulation for treating masticatory muscle spasticity in children with cerebral palsy. This review will follow the recommendations of the Cochrane Handbook for Systematic Reviews of Interventions and PRISMA statement and will be registered at the PROSPERO platform. A comprehensive search of the literature will be performed using an electronic search (MEDLINE, Embase, Cochrane Library, LILACS, BBO, Clinicaltrials.gov, and WHO/ICTRP) with no restriction regarding date and language. The grey literature will also be screened via OpenGrey. We will consider randomized (RCT) and non-randomized clinical trials (NRCT), that assessed the use of photobiomodulation compared with placebo, no intervention, or another active intervention. Primary outcomes will be muscle spasticity relief, pain intensity, and adverse events. Secondary outcomes will be muscle fatigue, the amplitude of mouth opening, and tooth wear prevention. Two authors will independently select the references retrieved by search strategy using the software Rayyan and will extract the data from included studies. All discordance will be solved by a third author. The risk of bias assessment will be performed using the RoB tool for RCTs and ROBINS-I for NRCT. For the treatment effects estimative, we will calculate mean differences for continuous outcomes and risk ratios for dichotomous outcomes (CI 95%). When possible, treatment effects will be combined in a meta-analysis using the random-effect model in the Review Manager 5.4 software. Heterogeneity between studies will be explored. The certainty of the evidence will be assessed using the GRADE approach.

Notes:

Evaluation of Cancer Stem Cell Subpopulations in Oral Squamous Cell Carcinoma after Photodynamic Therapy

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The presence of the cancer stem cells (CSC) in oral squamous cell carcinoma (OSCC) has been previously associated with recurrence, resistance to conventional therapy, and poor prognosis. Thus, there is an urgent need to improve the treatment of OSCC, mainly for patients with recurrent or metastatic disease. Photodynamic therapy (PDT) is a minimally invasive therapy able to promote direct cell death immune surveillance, and disrupts tumor vasculature. Thus, this study evaluated the subpopulations of CSC identified with the phenotype CD44 high/ESA high and CD44 high/ESA low in OSCC cell lines as well as the expression of MICA/B (stressed-induced ligand for Natural Killer cells). Ca1 and Luc4 cell lines were divided into control, LED, 5-aminolevulinic acid (5-ALA, 1mM), and 5-ALA-PDT (5-ALA+LED) groups. Cells were irradiated with a diode emission light (LED) using the Bio Lambda Led BOX, 660nm, 6J/cm², 49.5 mW/cm². Cells were incubated for 24h and then collected to evaluate the expression of CD44, ESA, and MICA/B by flow cytometry. The subpopulation of CSC with the phenotype CD44 high/ESA high (epithelial morphology) was significantly decreased after PDT when compared to control, LED, and 5-ALA groups. However, no difference was observed in the percentage of cells with the phenotype CD44high/ESAlow (mesenchymal morphology) in all groups. MICA/B expression was induced after PDT. In conclusion, PDT was able to decrease the CD44 high/ESA high cells and to promote the expression of MICA/B, contributing to eradicate the CSC and probably, to the activation of immune cells.

Notes:

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