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TREATMENT OF ORAL MUCOSITIS INDUCED BY IONIZING RADIATION IN HAMSTERS WITH LOW POWER LASER

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Background and Objectives: The laser action mechanisms on oral mucositis are not completely understood. The aim of this work was to compare laser therapy with topical benzidamine treatment of oral mucositis induced by ionizing radiation in hamsters.
Study Design/Materials and Methods: 44 Gold Syrian hamsters were irradiated at head with a 30 Grays single dose by source of Co^{60}. After ionizing irradiation, animals were divided in two therapeutic groups: topical benzidamine 0,15% and low intensity laser (GaAlAs, $\lambda = 780$ nm, 50 mW, 6 J/cm^2, 5 s, 8 points). Both treatment modalities were applied daily during 20 consecutive days, and oral mucositis severity was assessed by two calibrated observers. Animals were sacrificed in 6 distinctive periods (day 0, 8, 10, 15, 18 and 20) for histological analysis of lower labial mucosa. Collagen fibers and cellularity present at the connective tissue were quantified using the digital morfometry software ImageLab2000.
Results: Chebyshev inequality statistical analysis of clinical data showed significant lower grade of oral mucositis in laser group compared to benzidamine group at days 15, 18 and 20 ($p < 0,05$). Histological statistical analysis by chi-squared test showed higher cellularity at days 8, 10 and 15, higher collagen at days 8, 10 and lower collagen at days 18 and 20 in the laser group compared to benzidamine group ($p < 0,05$).
Conclusions: With parameters used in the experiment, laser therapy reduced severity of oral mucositis induced by ionizing irradiation in hamsters and accelerated tissue regeneration when compared to topical benzidamine therapy.

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CHANGES IN CUTANEOUS GENE EXPRESSION LEVELS FOLLOWING TREATMENT WITH A COMBINATION (1320 nm/1440 nm) FRACTIONAL LASER

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Background and Objective: Clinically appreciable changes in the skin that follow treatment with fractional lasers are the result of changes in gene expression levels. We used gene microarray technologies to identify candidate transcripts with increased or decreased expression following treatment with a combination Nd:YAG fractional laser that emits two wavelengths in sequence.
Study Design/Materials and Methods: For each of the 3 study participants, 2 areas of postauricular skin were designated to receive laser treatment or no laser treatment (control). Forty-eight hours after treatment, skin from both areas was harvested and used for isolation of cDNA. Derivative cDNA samples were subjected to microarray analysis, assessing the expression levels of 89 extracellular matrix and cell adhesion molecule genes in each sample, and expression levels in laser-treated vs. control skin were compared for each subject.
Results: Of the 89 genes represented on the microarray, laser treatment resulted in upregulation and downregulation of 36% and 64% of transcripts, respectively. Composite analysis of all patients revealed 31 genes with >3-fold increased/decreased expression in laser-treated vs. control samples. Of these, MMP 14–16 were downregulated 24.59, 7.94, and 5.86-fold, respectively, and integrins β1, β3, and β4 were downregulated 4.04, 8.51, and 7.11-fold, respectively. Collagens 6A2, 7A1, 8A1, and 14A1 were downregulated 18.44, 8.32, 29.54, and 5.6-fold, respectively. SPARC, a matricellular protein essential in regulating melanoma cell growth, KAL-1, a protein that contributes to adhesion of epidermal cells during morphogenesis, and Fibronectin-1 were downregulated 5.43, 5.01, and 3.69-fold, respectively.
Conclusion: These data identify candidate genes that may contribute to the early clinical effects of fractional resurfacing. Future work will focus on *in vivo* expression analysis to further substantiate their role in this process.

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MITOCHONDRIAL ELECTRON TRANSPORT CHAIN ASSEMBLY STATE INFLUENCES THE RESPONSE OF NEURONAL CELLS TO LOW ENERGY LASER TREATMENT

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Background and Objectives: Previous studies proposed that the benefits of phototherapy are based on the absorption of light by the mitochondrial electron transport chain (ETC). We have generated mitochondrial DNA (mtDNA)-free Rho0 neuroblastoma cells that are unable to correctly assemble complexes I, III, IV and V. We also generated cytoplasmic hybrid (cybrid) cells that express the mtDNA of patients with Parkinson s disease (PD) and exhibit incomplete assembly of complexes I and IV.
Study Designs/Materials and Methods: We studied axonal transport of MitoTrackerCMX-Ros-labeled mitochondria in differentiated PD cybrid neurons using time-lapse microscopy. We also measured cellular respiration in PD cybrid neurons and Rho0 cells using an Oxygraph-2k (Oroboros). ETC assembly was visualized using a panel of antibodies (Mitosciences).
Results: Rho0 cells and PD cybrid neurons were exposed to constant illumination with an 810 nm low energy laser treatment (LELT, 50 mW/cm^2 for 40 sec). Rho0 cells failed to exhibit increased cellular respiration after LELT. PD cybrid neurons with significantly reduced assembly of complexes I and IV also failed to increase cellular respiration or increase axonal transport of mitochondria in response to LELT. However, PD cybrid neurons with a greater percentage of correctly assembled complex I and IV were able to both increase cellular respiration and axonal transport of mitochondria.
Conclusion: Correct assembly of the mitochondrial ETC is necessary for LELT to modify the cellular respiration and axonal transport of mitochondria in Rho0 cells and PD cybrid neurons. Further studies are needed to determine which complexes in the mitochondrial ETC are essential to generate the benefits of phototherapy.