intensity by spectroscopy was measured under two wavelengths conditions: 665 nm (EB-sensitive) and 772 nm (EB-insensitive). The 665/772 nm ratio was used as a penetration indicator - low ratio denoted to higher EB penetration and high ratio to low EB penetration. High resolution digital microscopic photography was used for subjective qualitative analysis.
Results: At 0-min incubation time, EB penetration was significantly higher at 70 W vs 40 W ($p < 0.01$). At 15-min, EB penetration was significantly higher when compared to 0-min for 70W vs 40 W, respectively. EB color intensity vs distance (depth and width) were significantly higher for the RF + EB + US (99.66 ± 23.67 pixels) vs RF + EB (52.33 ± 25.34 pixels) and RF + EB + US (80.83 ± 15.41 pixels) vs RF + EB (66.83 ± 28.56 pixels), respectively ($p < 0.05–0.01$). Similarly, topical EB (2.1 ± 0.4) and topical EB + US (1.8 ± 0.3) spectrometry reflectance intensity ratios were high, indicating low EB penetration. In contrast, RF + EB + US (0.4 ± 0.02) vs RF + EB (1.4 ± 0.08) ratios were low, indicating significant higher EB penetration for the former ($p < 0.01$). Histology frozen sections of high resolution digital photographs were in agreement with the objective measurements.
Conclusion: US acoustic pressure following ablative RF permeation significantly enhances the amount of EB penetration as evidenced by depth, width and color intensity.

#87

FEMTOSECOND LASER HIGH INTENSITY IRRADIATION AS A PROPOSAL FOR ADJUVANT TREATMENT IN BURNED SKIN - AN *IN VIVO* MODEL

Moises Oliveira Santos, Wagner Rossi, Viviane Pereira Goulart, Anderson Zanardi Freitas, Ricardo Elgul Samad, Nilson Dias Viera, Telma Maria Tenorio Zorn, Denise Zezell

State University of Amazon and IPEN - CNEN/SP, Manaus, Brazil; IPEN - CNEN/SP; ICB – USP, Sao Paulo, Brazil
Background: Burns cause changes in the anatomical structure of skin associated with trauma. The conventional treatment is the use of topical natural or synthetic skin graft. An alternative is the laser ablation process for burned tissue necrosis removal. It allows fast controlled tissue removal, no mechanical contact and access to difficult areas. The purpose of this study is to evaluate the feasibility of using high intensity femtosecond lasers as an adjuvant treatment of skin burned patients.
Study: After local Ethical Committee in Animal Research approval, 20 Wistar rats were divided into 4 groups, according to sacrifice period (days 3, 5, 7 and 14 post-burn). Three regions of the back of the animals were exposed to steam source causing deep dermal burns. On the third day after burn, one of the regions was ablated with high intensity ultrashort-laser pulses ($\lambda = 830$ nm, 90fs, 2 kHz and 10 μJ/pulses), the other received surgical debridement, and the last was considered the control burn. The regions were analyzed by optical coherence tomography (OCT) for determining the optical attenuation coefficient of skin during healing and histology on the same time periods was used as a golden standard evaluation.
Results: The results showed that with the laser irradiation conditions used it was possible to remove debris from deep dermal burn. The skin ablation threshold was 2.3 $\mu J/cm^2$. With 5 scans of 11.4 $\mu J/cm^2$, total thickness removal was about 450 μm. The techniques used to characterize the tissue allowed to verify that all treatments promoted appropriate wound healing. On the fourteenth day, the regeneration curve showed that the optical attenuation coefficient relative of laser ablated tissue converges to the values of healthy skin.
Conclusion: The irradiation conditions of this study allow to conclude the feasibility of using femtosecond lasers of very high intensity as an adjunct in the treatment of skin burned patients using an *in vivo* model.

#88

EFFECT OF LASER-GENERATED SHOCKWAVES ON *EX VIVO* PIGSKIN

Vidyunmala Ramaprasad, Artemio Navarro, Shahzad Patel, Bryan Nowroozi, Zachary Taylor, Vijay Gupta, Warren Grundfest

University of California, Los Angeles, CA
Background: Persistent bacterial infection prolongs hospitalizations, leading to increased healthcare costs. Biofilm production is one mechanism of bacterial resistance. Our team investigates the use of laser-generated shockwaves to delaminate biofilm from infected wound surfaces. To safely employ this technique we must establish damage thresholds in tissue. The primary aim of this study is to determine the effect of the laser-generated shockwaves on porcine tissue samples which serve as a model for human skin.
Study: The system uses a Q-switched, Nd:YAG laser (Continuum) with an output from 100–500 mj/pulse using energies of 118, 149, 228, 264, 350, 400 and 498 through air with a 3 mm spot size. Previous studies by our team showed that these energies can delaminate biofilm off a variety of surfaces. A laser pulse irradiates the titanium coated mylar which generates a transient wave that is coupled through a liquid layer to the surface of ex vivo pigskin. The tissue was then fixed and sent to histology for analysis. There were two tissue samples per energy level and two control samples. A pathologist was blinded and asked to score the tissue sections on the basis of their overall appearance (O) and linear/slit-like spaces roughly parallel to the surface of the skin (S) on a scale from 0 to 3.
Results: No visible difference was seen between control and laser-shocked samples. Nine tissue samples received an O score of 2, and 8 received an S score of 2. There was no correlation between the scores received by the samples and the energy with which they were shocked. The sample that had the highest S score of 3 was the control, which appears to be due to sectioning artifacts.
Conclusion: The laser-generated shockwaves which are used to delaminate biofilm do not have an adverse effect on healthy pigskin.

#89

RELATIONSHIP BETWEEN SKIN PIGMENT AND PAIN IN RESPONSE TO LOW FLUENCE 810 nm LASER TREATMENT

Shyam Kishan Mandre, Frank Beerwerth, Jeremy Christman, Rob Baker, Jay F. Nash

P&G/Braun GmbH, Kronberg, Germany; The Procter & Gamble Company, Cincinnati, OH
Background: The purpose of this study was to determine the relationship between skin pigment and pain/discomfort in response to low-fluence 810 nm laser treatment at different anatomical sites. Skin color, i.e., melanin content, is an important aspect of safety/efficacy of light-based hair removal devices. It was