

## SPATIALLY CONFINED PHOTOTHERMOLYSIS OF DERMAL TARGETS USING AN IR-FIBERLASER IN COMBINATION WITH FOCUSING AND CONTACT COOLING

**D. Manstein,<sup>1</sup> M. Poureshagh,<sup>1</sup> I. Yaroslavsky,<sup>2</sup> G. Altshuler,<sup>2</sup> and R.R. Anderson<sup>1</sup>**

<sup>1</sup>*Wellman Laboratories of Photomedicine, Boston, MA*

<sup>2</sup>*Palomar Medical Technologies, Burlington, MA*

**Purpose:** To determine if a new method of spatially confined photothermolysis within the skin using a combination of an IR fiber-laser, cooling, and focusing can produce well-defined areas of intradermal damage.

**Methods:** 6 healthy subjects of light pigmented skin were enrolled in a prospective clinical study. 24 test sites (each 1 cm<sup>2</sup>) and 8 controls were mapped on the back. Within each test sites an array of 16 to 36 single pulses was applied. The positioning of the spots was performed by a computer-controlled x-y micro-stage. We tested the effects of wavelength (1065 nm, 1206 nm, and combination), pulse energy (3.5–25 J), pulse duration (1–5 s) and spacing between the laser pulses (1.7, 2 and 2.5 mm). Epidermal cooling (4°C) and intra-dermal focusing to a depth of 1mm was used. Follow-ups were performed at 1, 2, 4 weeks and 3 months.

**Results:** We have not observed any clinically evident epidermal damage or scarring for any of the subjects or test sites. All exposures could be performed without the need for any additional anesthesia. We observed varying degrees of erythema. For some test sites we observed consistently elevations of skin surface (“bumps”) that matched exactly the pattern of the laser spots. For these spots histology revealed sharply demarcated elliptical areas with loss of collagen birefringence. For other spots without any elevation we have found small areas of confined damaged with an elliptical shape with a diameter of the small axis of less than 200 μm at a depth of about 800 μm.

**Conclusions:** Intra-dermal damage including collagen denaturation with sharp demarcation and without any evidence for epidermal damage can be generated by a combination of this new IR-fiberlaser, cooling and focusing. This technique can be used for precise direct treatment of intra-dermal targets including collagen, sebaceous glands, vessels and hair follicles without the need for a selective chromophore.