

Do Acupuncture Points Have Different Absorption Properties to Laser Light than Surrounding Skin?

Harry Lazoura, Marc Cohen, Eliada Lazoura and Irena Cosic
Bioelectronics Group

Department Electrical and Computer Systems Engineering, Monash University,
Caulfield East, Victoria, 3145, AUSTRALIA.

ABSTRACT:

Traditional Chinese Medicine suggests that acupuncture points are sites of energy exchange between the body and the environment. We examined the relative absorption of near infra-red laser light (3mw, 780nm) using different pulse repetition frequencies at acupuncture points compared to non-acupuncture points. Results revealed that at 1 Hz absorption was greater at acupuncture points compared to nearby non-acupuncture points. At higher pulse repetition rates this difference was reduced. This suggests that acupuncture points do in fact have different absorption properties to non-acupuncture points and that there is a correlation between the skins' electrical conductivity and absorption of laser light.

INTRODUCTION:

Traditional Chinese Medicine proposes that health is an energetic balance between the organism and the environment and that acupuncture points are sites of energetic exchange that may be used to alter biological function. This energy may be in many forms including mechanical, thermal, electrical or electromagnetic including visible and infra-red light [1]. The idea that acupuncture points mediate energy exchange is supported by the fact that these points have been shown to have a lower electrical resistance compared to surrounding skin [2]. The emergence of low level laser therapy as an effective therapeutic modality also supports this notion.

Low level laser therapy involves the stimulation of

acupuncture points with laser irradiation so as to produce photo-biostimulation with effects that include analgesia, accelerated wound healing and the treatment of soft tissue injury and arthritic conditions [3]. While different frequencies of laser radiation have different absorption into tissue producing different biological effects [4], there is evidence to suggest that some bio-molecules preferentially absorb only certain size packets or pulses of radiation and that the pulse repetition frequency may be an important factor in enhancing photo-biomodulative effects.[5]

This study aims to determine the absorption of laser irradiation at acupuncture points compared to non-acupuncture points and to determine if there is differing absorption of laser light pulsed at different frequencies.

METHODS:

Near infrared laser light at a constant 3mW was produced from a 780nm laser diode, using specially designed feedback circuitry to maintain a constant output. This circuitry used a monitoring photo-diode, incorporated within the laser diode to provide a current proportional to output power. This current allowed the circuitry to eliminate any fluctuations in output power due to thermal effects and bias current changes. Focusing optics were used to collimate the laser light. The pulse repetition frequencies were controlled using additionally designed circuitry. This circuitry was interfaced via the parallel port of a computer and controlled using software written in Borland C++, specially for this purpose

Laser light was applied to the acupuncture points

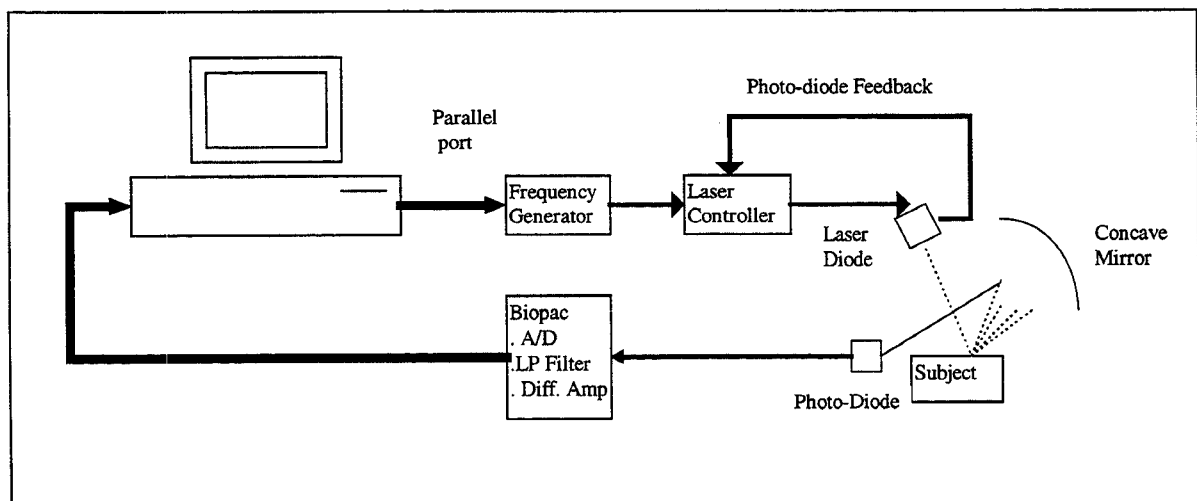


Figure 1
Experimental set-up

large intestine 3 and 4 (LI3 and LI4) as well as to nearby non-acupuncture points. Pulse repetition frequencies of 1, 2, 5, 10, 15 and 20 Hz with a 50/50-duty cycle were used. The acupuncture points were defined both anatomically by traditional acupuncture charts, as well as electrically by locating points with a reduced skin resistance using a multimeter. Points were chosen based on convenience of experimental set up and reliability of detecting low resistance points. It was found that the acupuncture points generally had an electrical resistance one order of magnitude lower than the non-acupuncture points. Care was taken to avoid obvious skin blemishes or moles at these points that may have altered the reflective properties of the skin.

Reflected radiation was collected and focused onto an infra-red sensitive receiver via a protected gold plated concave mirror (see Figure 1). The receiver had a peak response at 940nm and converted light into current. Daylight filters were used to minimise fluctuations due to ambient lighting. The current output of the receiver was converted into voltage, which was sampled and converted to digital information using the Biopac bio-potential amplifiers and data acquisition system. Signal analysis was carried out using the accompanying Acknowledge software [6].

RESULTS:

Preliminary results revealed that at 1 Hertz there was a lower output signal and therefore a greater absorption of laser at acupuncture points than at nearby non-

acupuncture points (Figure 2). Results also showed that at higher pulse repetition rates there was less difference between the acupuncture points and non-acupuncture points (see Table 1). However, pulse repetition frequencies above 10 Hz showed no significant changes.

Table 1 Mean positive (μ^+) and negative (μ^-) difference in amplitude between acupuncture and non-acupuncture points (in Volts).

Frequency (Hz)	μ^+	μ^-
1	0.749	0.772
2	0.146	0.813
5	0.471	0.918
10	NA	NA
20	NA	NA

NA (not applicable) as no measurable difference was observed.

CONCLUSION:

These results suggest that acupuncture points do in fact have different absorption properties to non-acupuncture points and that there is a correlation between the skins' electrical conductivity and absorption of laser light. The fact that there was less difference between the absorption of infra-red light at acupuncture points and non acupuncture points at higher pulse repetition rates suggests that the points may become 'saturated' preventing further absorption.

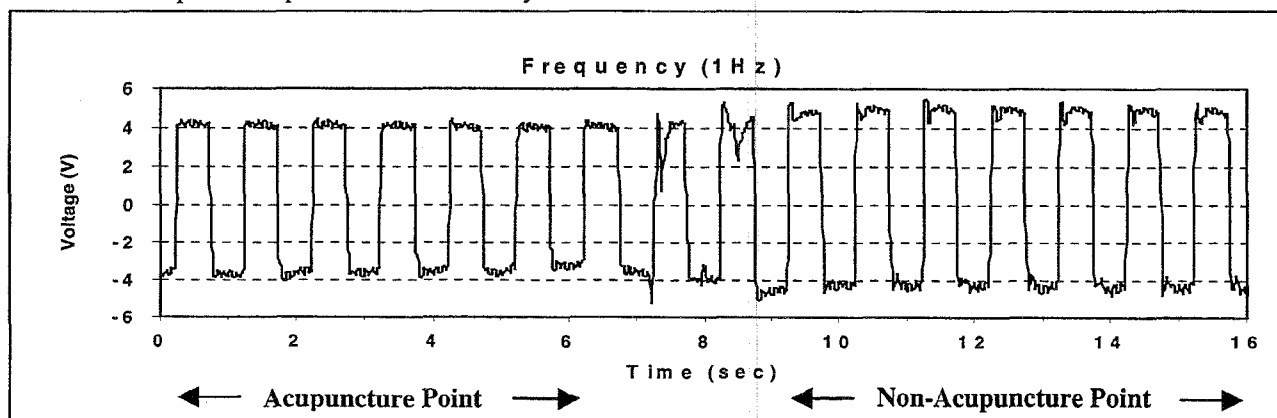


Figure 2

Voltage (V) versus time (sec) of reflected infra red radiation from the laser, at acupuncture and non-acupuncture points, at a pulse repetition of 1 Hz. The mean positive and negative difference in amplitude between acupuncture and non-acupuncture points is 0.749 V and 0.772 V respectively.

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