LOW INTENSITY LASER THERAPY AND PAIN RELIEF

G. David Baxter
Rehabilitation Sciences, University of Ulster, Jordanstown, BT37 0QB, Northern Ireland

The application of laser and monochromatic light sources at relatively low (i.e. essentially athermic) incident powers and energies to stimulate wound repair and to alleviate pain has been advocated for over three decades. Such therapeutic use is variously termed Low Level Laser Therapy (LLLT), Cold Laser Therapy or Low Intensity Laser Therapy (LILT), and represents a popular treatment modality in a number of countries, including the UK and Ireland. Despite such popularity, experience with the modality in the USA has been limited, principally due to the lack of FDA approval for such devices, at least until relatively recently.

While the use of low intensity laser irradiation to stimulate wound healing is arguably the most researched area of clinical application[1,2], and benefits from basic cellular and animal research findings which have served to elucidate the mechanisms underlying the observed clinical benefits[3,4], application of laser to treat pain has remained contentious[5].

The first clinical observations of the potential analgesic benefits of laser therapy were found to be associated with successful treatment of chronic wounds: i.e. as the wound resolved, so did any concomitant pain. Production of pain relief in such circumstances is perhaps unsurprising given the type of pain, (i.e. nociceptive pain), which would reasonably be expected to be alleviated as the lesion is successfully treated. However, laser therapy has found application in the treatment of a variety of painful conditions syndromes, beyond simple nociceptive pain. In attempting to explain the observed benefits in these cases, alternative mechanisms of action need to be considered.

Research in this area has focussed on the neurological effects of laser irradiation, using a variety of *in vivo* and *in vitro* models of neural function[5]. Such work has typically demonstrated measurable and selective effects of laser upon nerve conduction in humans and in animals[6-8]; however the direct relevance of such effects as an explanation of the pain relieving effects of these devices remains occult. It is clear that laser-induced pain relief is not primarily mediated by segmental inhibition, as irradiation in such circumstances is not perceptible in intact skin (thus discounting the possibility of stimulation of large diameter myelinated nerve fibres). However more subtle effects upon unmyelinated C-fibres is a possibility (currently unpublished data); this would suggest the possibility of antinociceptive effects, and mechanisms via which laser treatment could attenuate sympathetically-maintained pains such as complex regional pain syndrome. Apart from such direct physiological effects, laser irradiation has also been demonstrated to induce some of its analgesic effects via opiate-mediated mechanisms at the level of the central nervous system[9].

At the clinical level, a variety of studies have been completed to assess the effectiveness of laser therapy for pain relief, and in turn several reviews have been undertaken in an attempt to synthesise the available evidence from such studies[10,11]. Unfortunately, many of the reviews to date have focussed on the internal validity of the studies completed to date, and have paid scant attention to the rationale or clinical

reasonableness of the laser treatment regime utilised. More recently Bjordal and colleagues have addressed this, and found evidence of a dosage-related effect of laser upon tendinopathies[12].

While previously an area of contention, low intensity laser therapy would appear to offer promise as an effective non-pharmacological treatment for pain.

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