PILOT ISSUE 14:0 EDITORIAL
LASER THERAPY – SIXTEEN YEARS ON

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In September of 1988, as the Laser Therapy Founding Editor, I had the honour and pleasure of seeing my first joint Editorial to the Pilot Issue of Volume 1 of Laser Therapy in print, followed in March 1989 by the appearance of Volume 1:1 of the journal. Today, once again assuming the mantle of Founding Editor, I have the 16-fold honour and pleasure of providing this Editorial to Pilot Issue 14.0, marking what I believe will be the rise from its ashes of Laser Therapy, like the legendary Phoenix.

Preceding this Editorial, there is an Open Letter to you, the reader of the revived Laser Therapy journal, whether or not you are a current member of the World Association for Laser Therapy, WALT, which the journal served as its official organ from the first WALT meeting in 1996, just as it did the International Laser Therapy Association (ILTA), the predecessor of WALT, from 1988 to 1995. I will not rehash the contents of that letter in this Editorial, as you may have already read the letter: if not, however, I would ask you to read the Open Letter now, before continuing with the Editorial, as the letter will probably answer the questions which may well even now be forming in your brain. Suffice it to say that I believe with all my heart that the successful resuscitation of Laser Therapy is an absolute prerequisite to maintaining the integrity of WALT as an association dedicated to the concepts of phototherapy and photobiomodulation, and indeed to these concepts themselves.

In my overall perception of laser treatment, there are three main divisions: High reactive-Level Laser Treatment (HLLT), also referred to as laser surgery; Low reactive-Level Laser Therapy (LLLT), also referred to as laser therapy, and in the ‘gray area’ somewhere in between them we find Medium reactive-Level Laser Treatment (MLLT). I will just remind you here of the photobiological basis on which they were evolved.

All cells which make up the target tissue for laser energy, i.e., light energy, have a survival threshold. If they are damaged well above the level of that threshold by an explosive thermal (or in special cases, disruptive athermal) reaction, then the cells will be totally destroyed: this is photodestruction, and occurs during laser surgery thus enabling the use of the laser to incise, excise and vaporize tissue in a non-contact mode. The level of reaction in the cells is thus high and the surgical treatment is being carried out with a laser, leading to the term High reactive-Level Laser Treatment, HLLT. On the other hand, if the level of incident energy is below the survival threshold of the cells, then the level of reaction of the target cells is completely different, much lower than that with HLLT, and the activity of the cells is in some way modulated by the direct athermal energy transfer to the cell and its components. The modulated activity might be in the form of accelerated mitosis, enhanced cellular function or the repair of a compromised cell. In this case the low level of reaction is therapeutic and the therapy is being delivered with a laser, hence Low reactive-Level Laser Therapy, LLLT.

I must emphasize here it is definitely not the ‘laser’ which is ‘low level’, but the tissue reaction to the laser, which is after all only a source of light. A basic misunderstanding of this extremely important concept has occasionally led to the use of the term ‘low level laser’ as in ‘We used a low level laser for this patient’ even by some practitioners who should know better: this is totally the wrong usage and should be completely avoided, as it suggests somehow that laser therapy systems are inferior to other (i.e. surgical) lasers, which we all know is not the case: they are, as I have said before, two sides of the same coin. Please remember, and indeed never forget, that a 20 W CO2 laser over a 10 cm diameter spot, the size of a skin ulcer or burn wound, for example, delivers an incident power density of around 255 mW/cm², a truly therapeutic level; a 60 mW LLLT system, on the other hand, delivered on a 100 µm diameter spot delivers an incident power density of over 760 W/cm², which is a surgical level beam. For those of you rushing to your calculators to check these figures, please remember to half the diameter to get the radius of the spot size when applying the πr² formula to work out the area of the beam on the tissue!

Going back to my definitions of HLLT, MLLT and

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LLLT, in between the clearly-defined photosurgical (irreversible cell and tissue death) and phototherapeutic (reversible nonsurgical cell modulation) levels of reaction there is an area in which the damage threshold of the target cells may be very closely approached or even slightly exceeded, where the level of reaction is somewhere in between photodestruction and photobiomodulation. In this case, some target cells will be destroyed completely, some will suffer an intermediate range of damage but will survive, and others will be only very slightly damaged or not damaged at all. The level of reaction is intermediate, and caused by a laser, hence the term Medium reactive-Level Laser Treatment, MLLT. MLLT therefore comprises both irreversible and reversible reactions, although it falls into the field of laser surgery, but the balance of dead and living cells depends critically on the degree of the thermal effect over the irradiation time, and the final temperature in the target tissue. MLLT is a very interesting concept, including as it does elements of cellular damage (i.e. cell death) together with surviving photomodulated cells, and in fact forms the photobiological basis for so-called tissue welding, and for the residual heat damage or delivered heat damage on which ablative and nonablative skin rejuvenation absolutely depend, together with the very important photomodulated zone immediately beneath the thermal damage. I am afraid, however, that many aesthetic laser surgeons do not recognize or are even aware of the importance of these two zones in achieving the younger-looking skin they and their patients are hoping for!

When we consider a patient with a disease or some other abnormal condition such as pain, we are looking at someone whose organism is in a state of imbalance, whose normal homeostasis has been disrupted. The most important consideration we must take is to use the power of the laser specifically based on photon energy transfer to unlock the patient’s own spontaneous healing power, thereby assisting the organism to achieve homeostasis in an endogenous manner with the help of minimally invasive exogenous energy, namely light energy from a laser or other appropriate light source. Only with this approach can we really look at treating the condition which is causing the symptoms, rather than merely treating these symptoms themselves such as is often the case with the use of systemic or topically-applied drugs.

I said ‘minimally invasive’ above, but even in the case of laser surgery for extirpation of cancer, for example, we must absolutely remember that the photons do not stop at the area of excision or incision, even though the majority of the incident light energy may be used up in that reaction. Some photons will still penetrate into the tissue beyond the surgical area at a lower and lower photon density, and, depending on other factors such as waveform and wavelength, will create a range of thermally-dependent photoreactions in the tissue from coagulation through protein degradation, protein denaturation and mild thermal stimulation at temperatures below 40 °C, to a fairly extensive zone of pure athermal photobiomodulation. Thus even photodestructive laser surgery depends on photobiomodulatory laser therapeutic reactions for its successful result compared with other thermally-based surgical instrumentation such as electrocautery. The earliest reports on the surgical use of the CO2 laser in the early 1970’s showed less postoperative pain and improved initial healing compared with the same procedures with the scalpel. At first in the late 1980’s and early 1990’s we called this the α-effect, after a similar effect seen in pharmacology, but I now refer to this more accurately as autosimultaneous LLLT, as I have explained in my article elsewhere in this Pilot Issue. This is another reason why I object to our LLLT journal being absorbed in a journal normally associated with HLLT: I believe it should actually be the other way around, and Laser Therapy reviewers and editors never rejected papers of a laser surgical bent, provided the focus of the paper was on the specific autosimultaneous LLLT reactions rather than on the surgery per se: this will continue to be the case with Laser Therapy in its revived form.

To return to my thoughts on allowing an organism to ‘autorepair’ homeostatic disorders, I have always maintained that LLLT is one of the most efficient means of restoring balance to an unbalanced organism. With LLLT pain can be attenuated, but feeling can also be restored to numbed areas; areas of abnormal cutaneous hyperpigmentation can in certain cases be restored to the surrounding normal skin colour, but LLLT has been shown very effective in many cases of systemic vitiligo in the restoration of normal pigmentation to depigmented skin; LLLT can help patients with essential hypertension become normotensive or at least less hypertensive, but it can also help hypotensive patients reach more normal blood pressure readings; LLLT can help poorly conducting nerves achieve better conductance, but can also restore normal conductance patterns in hyperexcited nerves; LLLT can help normal wounds heal more quickly, but can also restore normal healing to static wounds, such as the nonhealing crural ulcers which launched laser therapy into the medicoscientific field almost 40 years ago with the work of the Godfather of LLLT, the late Professor Endré Mester. This apparently antithetical list is long, and continues to grow longer. However, these are not really antitheses, but simply examples of a state of impaired balance, affecting the patient’s normal homeostatic condition.

Precisely because of this duality of tissue response to LLLT, comprising both an accelerator and a brake, we subtitled the original Laser Therapy as ‘An Interna-
tional Journal of Laser Therapy and Photobioactivation’, rather than using the popular ‘biostimulation’ coined by Professor Mester: for what Professor Mester was doing, biostimulation was the correct term, but for what I have described above involving both stimulation and retardation, I felt that photobioactivation was correct, and indeed I still do: when you activate the accelerator, the car goes faster – stimulation; when you activate the brake, the car goes slower – retardation. However, in deference to the new terminology, you will see that ‘Photobioactivation’ in the subtitle on the journal front page has been replaced by ‘Photobiomodulation’. Another change is the replacement of ‘Laser Therapy’ in the subtitle with ‘Phototherapy’, so that the entire subtitle now reads ‘An International Journal of Phototherapy and Photobiomodulation’. In recent years, other noncoherent and polychromatic light sources have been added to the therapist’s armamentarium, including intense pulsed light (IPL) sources and light emitting diodes (LEDs). Even more recently, LED development has given us a new generation of LEDs with extremely narrow, almost monochromatic wavelengths, enhanced output powers and controlled divergence. The LED is now a serious member of the group of clinically useful phototherapy sources. Why, then, do we keep the name ‘Laser Therapy’ for the journal? Simply because the preponderance of both clinical and research reports are still on laser therapy-based systems, there are many more LLLT systems in the hands of clinicians, physiotherapists and other therapy-related health professionals, and of course the World Association for Laser Therapy, our WALT, still has the same name!

There may well come a day in the not too distant future when a name change has to be considered, and LLLT may well come to stand for Low reactive-Level Light Therapy, but till that day arrives, Laser Therapy shall remain as the title of this journal, and the journal will continue to offer a completely dedicated forum for all things concerned with phototherapy and photobiomodulation, whether delivered with a laser an IPL system, LEDs or any other therapeutically useful light source.

To make up this Pilot Issue 14:0 (Issue 14:1 is planned for February/March of 2005), we have selected some of the most important papers which pushed out the clinical and scientific envelope of laser therapy and photobiomodulation over the first 41 issues of the journal (the first Pilot Issue and 4 issues each in Volumes 1 to 10 inclusive). You will find a combination of basic research landmarks, clinical landmarks and better ways of quantifying and qualifying laser therapy. For reasons of space and cost constraints (this Pilot Issue 14:1 is free of charge to you) we were not able to include all of the papers which reached the short list from which the final papers were chosen, but I hope you will see from this overview spanning the 10 years during which Laser Therapy appeared with 4 issues per volume the large range of subjects we will continue to cover, and very importantly, the physical quality of the copy editing, printing and binding of the new ‘Laser Therapy’ proudly presented in its original livery, and why this should really continue to be the official journal of the World Association for Laser Therapy. We wait for and welcome your papers on all clinical and research aspects of phototherapy and photobiomodulation in any field, from any speciality, and from all health care professionals practising laser therapy. In the Americas and Western Europe, please send your papers to Dr Mario A Trelles, the Editor-in-Chief at the address and formats given in the Instructions for Authors. For Eastern Europe and the rest of the world, please send your submissions to Professor Hayk Arakelyan, Laser Therapy Co-Editor. I am very happy and very proud to hand over the journal to those pairs of extremely capable hands.

Tokyo, September 2004
Toshio Ohshiro,
Laser Therapy Founding Editor, 1988 and 2004
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The following generously donated to maintain Laser Therapy, and are hereby recognized as WALT Life Members

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