Low Level Laser Therapy
Electron Volt Theory
Synopsis of a Lecture by Ryan Maloney, January 5, 2009

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Lasers are a source of energy called photons.

Photons are a packet of energy.

Laser literature frequently measures laser energy in joules.

However, joules are too large to appropriately measure the energy of photons. (It would be like measuring your shoe size in miles).

Consequently, the preferred method for measuring the energy from a single photon by physicists and solid-state chemists is by using the "electron volt."

The electron volt energy of a photon is dependent upon its wavelength.

Wavelengths below 400nm (like x-rays) have so much energy that they eject electrons away from atoms. This is called ionization, and it damages tissue, and can even cause cancer. This was first established in experiments by Albert Einstein.

Wavelengths between 400nm to 660nm have less energy, they do not eject electrons, they do not cause ionization, and do not damage tissue.

However, wavelengths between 400nm to 660nm have sufficient energy to displace electrons in atoms to a higher energy state (level). This is desirable because the higher energy level electron is now more available for donation, expediting the efficiency of all human physiological processes.

The electrons influenced by the laser will in turn influence adjacent electrons, creating the cascade of systemic influence that has been documented in laser physiology. This is known as the London Dispersion effect.

Importantly, the brightness of the laser light (milliwatts / watts) is irrelevant.

Longer wavelengths (above 660nm) penetrate deeper, but at a cost of reduced electron volt ability to displace electrons to a higher energy state. Just because there is deeper penetration does not mean that it excites electrons to a higher energy level better. Therefore longer wavelengths have a reduced ability to biomodulate physiological processes because of their reduced ability to excite electrons to a higher energy state.

To compensate, longer wavelength lasers require more milliwatts / watts to achieve an acceptable physiological response.

Unfortunately, more milliwatts / watts is associated with heating of the tissues and its associated deleterious effects.