ATTENUATION AND PENETRATION OF VISIBLE 632.8nm AND INVISIBLE INFRA-RED 904nm LIGHT IN SOFT TISSUES

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We studied the depth of penetration and the magnitude of attenuation of 632.8nm and 904nm light in skin, muscle, tendon, and cartilagenous tissues of live anaesthetized rabbits. Tissue specimens were dissected, prepared, and their thicknesses measured. Then, each wavelength of light was applied. Simultaneously, a power meter was used to detect and measure the amount of light transmitted through each tissue. All measurements were made in the dark to minimize interference from extraneous light sources. To determine the influence of pulse rate on beam attenuation, the 632.8nm light was used at two predetermined settings of the machine; continuous mode and 100 pulses per second (pps), at an on:off ratio of 1:1. Similarly, the 904nm infra-red light was applied using two predetermined machine settings: 292 pps and 2,336 pps. Multiple regression analysis of the data obtained showed significant positive correlations between tissue thickness and light attenuation ($p < .001$). Student's t-tests revealed that beam attenuation was significantly affected by wavelength. Collectively, our findings warrant the conclusions that (1) The calf muscles of the New Zealand white rabbit attenuates light in direct proportion to its thickness. In this tissue, light attenuation is not significantly affected by the overlying skin, a finding which may be applicable to other muscles. (2) The depth of penetration of a 632.8nm and 904nm light is not related to the average power of the light source. The depth of penetration is the same notwithstanding the average power of the light source. (3) Compared to the 904nm wavelength, 632.8nm light is attenuated more by muscle tissue, suggesting that is is absorbed more readily than the 904nm wavelength or conversely that the 904nm wavelength penetrates more. Thus, wavelength plays a critical role in the depth of penetration of light.