

THE EFFECTS OF LOW LEVEL LASER THERAPY (LLLT) ON HUMAN BREAST CANCER CELL LINES IN VITRO. Lisa Laakso, Katie Powell, Ann McDonnell; Griffith University, Brisbane and Gold Coast, Australia.

PURPOSE: This research examined the response of two breast cancer cell lines (MCF-7 and MB-435) in vitro to a range of laser doses at two commonly used wavelengths (780nm and 830nm). **RELEVANCE:** LLLT is being used increasingly for the clinical management of post-mastectomy lymphoedema without clear, undisputed evidence of its effectiveness in this disorder. In particular, information regarding dose-response relationships and safety (in malignant conditions) remains elusive. This research set out to clarify dose/response relationships in cell culture as a starting point towards making some clinical recommendations for use. **PARTICIPANTS:** In vitro cell cultures. **METHODS:** Differentiated human breast adenocarcinoma (MCF-7) and less differentiated human breast ductal carcinoma (MB-435) cell lines were grown and passaged using standard aseptic tissue culture protocols. 96-well tissue culture plates were seeded with 1×10^4 cells per well in fresh growth medium, and allowed to grow for 48-72hrs before exposure to laser irradiation. A single dose of irradiation was performed at energy densities of 0.5, 1, 2.5, 10 and 12J/cm² for 780nm laser, and 0.5, 1, 2.5, 10 and 15J/cm² for 830nm laser. Cell proliferation was assessed 24hrs after laser treatment by calorimetric spectrophotometry. **ANALYSIS:** Percentage differences between treated and control means, and Student t-tests with a 95% confidence limit were calculated. Alpha level was set at 0.05 for all tests. **RESULTS:** Laser at 780nm using doses from 0.5 to 5J/cm² resulted in no significant difference in cell proliferation in MCF-7 (adenocarcinoma) cells. A trend towards increased MCF-7 cell proliferation was evident with a dose of 10J/cm² (13.37% mean percentage increase) becoming significantly increased at 12J/cm² ($p < 0.05$). 780nm laser at doses from 0.5 to 5J/cm² resulted in no significant difference in MB-435 (ductal carcinoma) cell proliferation but at 10J/cm² there was a significant increase in MB-435 cell proliferation compared to negative controls ($p < 0.05$). Laser irradiation at 830nm at doses from 0.5 to 2.5J/cm² resulted in no significant difference in MCF-7 cell proliferation. At doses of 10 and 12J/cm², significant increases ($p < 0.05$) in MCF-7 cell proliferation were observed. 830nm laser at doses from 0.5 to 10J/cm² had no effect on MB-435 cell proliferation. At 15J/cm² there was a statistically significant increase ($p < 0.05$) in MB-435 cell proliferation with 830nm laser. **CONCLUSIONS:** The findings suggest that 780nm and 830nm laser at doses up to 5J/cm² does not stimulate cell proliferation in two breast cancer cell lines studied. Higher doses selectively result in cell proliferation using both wavelengths studied, and in both human breast carcinoma cell lines. We plan to investigate further the in vitro effects of other typical laser wavelengths used in lymphoedema treatment prior to extending the research to in vivo and clinical models. **IMPLICATIONS:** The results of this research imply that low doses of laser less than 5J/cm² at the wavelengths stipulated are potentially safe for clinical use in the presence of the human breast cancer cell lines studied. Whilst findings from in vitro research cannot be considered transferable to clinical application, the findings provide some guidance on where to focus future work on in vivo models of treatment and in clinical applications. **KEYWORDS:** laser therapy, cancer **FUNDING ACKNOWLEDGEMENTS:** Unfunded.