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Photobiomodulation and photobio-inhibition of cancer stem cells and use of photodynamic therapy as possible therapeutic modality

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Cancer is a global burden, which have prompted extensive research into cancer prevention and treatment for many decades. Scientific studies have shown that a subset of cells within a tumour, called cancer stem cells (CSCs), can initiate tumour genesis. Low-intensity laser irradiation (LILI) has been applied in the treatment of numerous diseases and pathological conditions. Photobiomodulation has been shown to stimulate proliferation of cells, capillary growth, and cellular metabolism as observed by adenosine triphosphate activation. It has been shown, by using different fluences and wavelengths, LILI, can either stimulate or inhibit cellular functions. Cancer research is highly focused on improving current cancer treatments. One method of targeted cancer therapy is Photodynamic therapy (PDT), LILI, along with a photochemical compound, is used. When implementing a mechanism by which CSCs are targeted, LILI might pose as a viable treatment option. Studies have shown that using high fluences of LILI cell death may be induced in normal and neoplastic cells. In our work, lung and breast CSCs were isolated using stem cell markers and irradiated at wavelengths of 636, 825 and 1060 nm at fluences ranging from 5 J/ cm² to 40 J/cm². Post irradiation biochemical assays were conducted to monitor cellular responses including; proliferation and cytotoxicity, after 24 hours incubation. Results indicate that LILI, when treating CSCs, can induce either a bio-stimulatory or bio-inhibitory effect depending on the wavelength and fluence used. This study indicated successful cell damage in CSCs when using HF-LILI, as well as, stimulation of ATP production, when using lower fluences of LILI.

Biography

Heidi Abrahamse is the Director of the Laser Research Centre, University of Johannesburg and Department of Science and Technology/National Research Foundation SARChI Chair for Laser Applications in Health. Her research interests include, Photobiology and Photochemistry with specific reference to photodynamic cancer therapy, stem cell differentiation and wound healing. She has supervised 40 Master's; 15 Doctorates and 12 Post-Doctorate fellows and has published 116 accredited journal publications, 42 full paper proceedings and 11 chapters. She serves on the Editorial Boards of 8 international journals while acting as reviewer for over 40 journals. She serves as Co-Editor in Chief of the international accredited journal *Photomedicine and Laser Surgery*.

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