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Ability of ZnPcS_{mix}-phthalocyanine in inducing cellular death in human breast cancer cells (MCF-7) using laser irradiation

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Abstract content
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I.M.Tynga, N.N. Houreld and H. Abrahamse
Laser Research Centre, Faculty of Health Sciences, University of Johannesburg, P.O. Box 17011, Doornfontein, Johannesburg, 2028, South Africa Tel: +27 11 559-6406 Fax +27 11 559-6884 Email: habrahamse@uj.ac.za

Background: Approximately 180,000 new cases of breast cancer are diagnosed yearly worldwide and is the leading cancer for women in SA and around the world. Photodynamic therapy (PDT) is a light induced chemotherapy process which is used for cancer treatment. The administration of a drug and its incorporation into body tissues is done in a selective manner so that cancerous tissues are mainly affected. The aims of this study were to determine the effects of ZnPcS_{mix} on MCF-7 cells and identify the mode of cell death induced by PDT using the optimum ZnPcS_{mix} concentration and laser fluency. Methodology: In order to determine the ability of ZnPcS_{mix}to induce cell death in MCF-7 cells the following techniques and assays were performed: cellular morphology (inverted microscopy), subcellular localization (fluorescence microscopy), viability (trypan blue staining and adenosine triphosphate, ATP, luminescence), proliferation (AlamarBlue® assay) and cytotoxicity (Lactate Dehydrogenase, LDH). The mode of cell death was determined by flow cytometry (Annexin-V), Hoechst staining and Enzyme linked immunosorbet assay (ELISA). Results: Most PDT-treated cells rounded off and were identified as free floating structures. Mitochondrial, lysosomal and perinuclear localizations were found to be the cellular primary localization sites of ZnPcS_{mix}. The optimal parameters were identified as 0.5 μM of ZnPcS_{mix} at 10 J/cm²and treated cells showed a 50% decrease in cell viability, low proliferation and high cytotoxicity. More than 90% of cells were found to be apoptotic, and nuclear and nucleosomal fragmentation occurred after treatment. Conclusion: The treatment is an effective method to induce cell death in MCF-7 cells and apoptosis was found to be the main mode of cell death. ZnPcS_{mix} mediated PDT may be considered for designing a more effective cancer treatment.

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Prof Abrahamse, Laser Research Centre, University of Johannesburg

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Primary author: Mr MFOUO TYNGA, Ivan (Student)

Co-authors: Prof. ABRAHAMSE, Heidi (Laser Research Centre); Dr HOURELD, Nicolette (Laser Research Centre)

Presenter: Mr MFOUO TYNGA, Ivan (Student)

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