# The Photodynamic Effect of Aluminium and Zinc etrasulfophthalocyanines on Melanoma Cancer Cells

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Abstract: Aluminium and zinc tetrasulfophthalocyanines were activated with a 672nm wavelength laser to investigate the photodynamic effects on melanoma cancer, dermal fibroblast and epidermal keratinocyte cells. Aluminium tetrasulfophthalocyanine was more effective in killing the melanoma cells.

Photodynamic therapy (PDT) is a promising treatment for cancer. It involves the combination of a photosensitizer (PS) and light of an appropriate wavelength (laser source) to cause the destruction of cancer cells. Phthalocynanines are second–generation PS with enhanced photophysical and photochemical properties [1]. For each of the cell lines approximately 2 x $10^4$ cells/ml were seeded onto 24–well cell culture plates and allowed to attach overnight, after which cells were treated with different concentrations of aluminium (AlTSPc) or zinc (ZnTSPc) tetrasulfophthalocyanines. The photosensitizers were synthesized at Rhodes University. After 2hrs, cells were irradiated with a diode laser at a wavelength of 672nm and a beam diameter of 1cm. The laser power varied between 20-30mW and the irradiation time was calculated to deliver a light dose of 4.5J/$cm^2$. Post–irradiated cells were incubated for 24hrs before cell viability was measured using the CellTiter-Blue™ Viability Assay.

A dose-dependent relationship between the PS and the cell viability of melanoma cancer cells is shown in Figure 1 A & B.

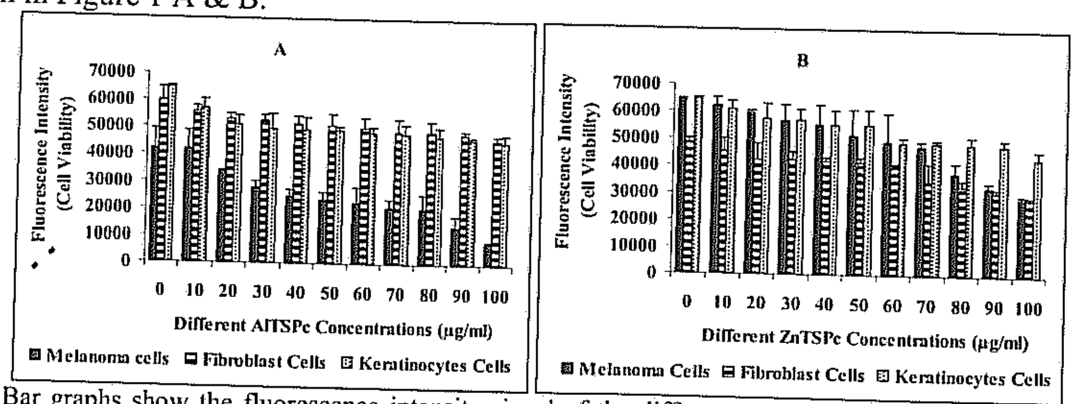


Figure 1. Bar graphs show the fluorescence intensity signal of the different cell lines after treatment with different concentrations of AlTSPc (A) or ZnTSPc (B) and laser irradiation. The fluorescence intensity signal is proportional to cell viability. 0 µg/ml = untreated cells.

Results indicate that AlTSPc was more effective in killing the melanoma cells at increased PS concentrations as compared to ZnTSPc. As the concentrations of the PS increased the cell viability of fibroblast and keratinocyte cells decreased. Therefore, low PS concentrations of 40-50µg/ml can be used to effectively kill cancer cells and minimize the killing of healthy normal cells during PDT treatement. This concludes that AlTSPc and ZnTSPc exhibit the potential to be used as a PS in photodynamic therapy for the treatment of melanoma cancer.

1. C. Hopper, "PDT": a clinical reality in the treatment of cancer, " Lancet Oncol. 1, 212-19, (2002).