Photo-cytotoxity of ruthenium phtalocyanine in cancer cells induced by light irradiation

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Photodynamic therapy (PDT) is a clinical therapy approved with specific cytotoxicity to tumor cells presenting the minimum harmful effects. The clinical treatment involves a combination of photosensitizer agent, light energy, and oxygen to generate reactive oxygen species (ROS), like singlet oxygen ($^1O_2$), cytotoxic specie towards a cancer cells[1]. One of the possible photosensitizers for PDT uses is phtalocyanines due electronics properties, low toxicity and high stability. In this way the proposal of this study is the evaluation of cytotoxicity from ruthenium phthalocyanine complex ([Ru(Pc)], Pc = phthalocyanine) under specific irradiation wavelength (λ=660nm) producing ($^1O_2$) in different cancer cell lines, human breast cancer (MB-MDA468 and MCF7) and murine melanoma (B16F10). Thereby, we are presenting the synthesis, characterization, photobiological properties and action mechanism of [Ru(Pc)] in cancer cells. The absorption spectrum of [Ru(Pc)] complex in chloroform presents Soret band in 314 nm and Q band in 642 nm, characteristics of ruthenium phthalocyanine compounds. Fluorescence spectroscopy was performance and has showed emission bands at λ_{em} = 698 nm and λ_{ex} = 656 nm. The production of ($^1O_2$) was measured through indirect method and the quantum yield was ϕ = 0.62. The cellular viability under irradiation (λ = 660 nm) and without photo stimulus was assessed by MTT assays in MCF7 and B16F10 cancer cells. The [Ru(Pc)] complex was incubated for 24 hours in the presence (5,95 J/cm^2) and absence of photo stimulus. The results, although preliminary, showed the cellular viability was 3% (0,5 μM) to MCF7 and 1% (0,5 μM) to B16F10 under irradiation (λ = 660nm). To evaluate the action mechanism in breast cancer (MB-MDA468) induced by [Ru(Pc)] complex photostimulated (λ = 660 nm), the Comet assay was performed. The DNA damage was observed by DNA migration through electrophoresis gel. The lysis of deoxyribonucleic acid was corroborated with PARP expression increase in Western Blot assay. The preliminary results has showed that [Ru(Pc)] complex synthesized and characterized in this work presented high cytotoxicity against both tumor cell lines under irradiation. The studies suggest there is a DNA interaction and a high production of singlet oxygen. The synergism of these effects is very promising for use of this complex as photosensitizer in Photodynamic Therapy.

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1. Agostinis, P., *et al.,* CA: A Cancer Journal for Clinicians (2011), 250-281.