The First Treatment with Silica Nanoparticles (SiO2) Loaded with Ruthenium (Ru(bpy)32+) to Eliminate Pancreatic Cancer Cells

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Silica nanoparticles (SiO2) can selectively and safely destroy tumor cells when loaded with ruthenium complexes, reducing the toxicity of antitumor therapy. Approximately 44,330 patients with pancreatic cancer die annually and many of these deaths can be attributed to side effects of medications. There is a need for new effective treatments against pancreatic cancer. Will the silica nanoparticles (SiO2) immobilize ruthenium salt (Ru(bpy)32+) in its internal and external pores using photoexcitation with blue light and the conversion of free oxygen from the body to singlet oxygen as a toxic material to eliminate pancreatic cancer cells? Silica nanoparticles possesses large amounts of mesoporous spaces in and out, in addition to negative charges that allows the immobilization of molecules with positive charges. This can create an attractive interaction with the Ru(bpy)32+. Then pancreatic cancer cells can be killed using photoexcitation and the conversion of the free oxygen from the body into singlet oxygen as a toxic material. A mother sample with a molarity of 0.000211g/mol with Ru(bpy)32+ was created to prepare 5 experimental samples, which contained 0.4g of SiO2 and different concentrations of the mother solution. Absorption and fluorescence spectroscopy experiments were performed on each of the sample to determine the loading of (Ru(bpy)32+) in SiO2. Sample 2, which showed optimum physical properties, underwent photoradiation with blue light to observe the effectiveness of the treatment and the reaction with pancreatic cancer cells. The nanoparticles and Ru(bpy)32+ showed to be effective because they used free oxygen in the body into singlet oxygen and eliminate pancreatic cancer cells.