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Abstract

In Vitro Evaluation of Rare-Earth-Doped Phosphor Nanoparticles to Assess Their Antitumoral Efficiency on Lung Cancer Cells †

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Abstract: Rare-earth-doped nanoparticles have been investigated for their use in disease diagnosis, drug delivery, tumor therapy and bioimaging. In this context, we selected $BaSO_4$:Eu phosphor nanoparticles, commercially available from Merck (Darmstadt, Germany), to evaluate their antitumoral efficiency for prospective therapeutic applications, as no study was previously performed. Lung carcinoma epithelial cells (A549 cell line) were incubated with barite ($BaSO_4$) nanophosphors for up to 72 h. The highest concentration of nanoparticles tested (200 µg/mL) decreased the number of viable cells only by 10% compared to controls, as measured using the (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) (MTT) test. This result was also confirmed by the double staining of viable and dead cells with calcein-AM and ethidium homodimer, respectively. In addition, the level of nitric oxide released by the cells in the media after incubation with the nanoparticles increased by 10% compared to controls, showing that no major inflammation was induced even in the presence of high concentrations of particles. However, an increased accumulation of lysosomes was noticed with LysoTracker Green DND-26 (Invitrogen^{TM}, Waltham, MA, USA) in a time- and dose-dependent manner. This finding could suggest that the cells are further eliminating Eu-doped barite particles via their uptake by these acidic organelles. In conclusion, our investigation revealed no significant anti-proliferative effects of $BaSO_4$:Eu phosphor nanoparticles on lung tumor cells, but further investigations related to their cytotoxicity should be performed for a better characterization in a biological environment.

Keywords: rare-earth-doped phosphor nanoparticles; barite; europium; cancer cells

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