Hybrid gold-protein nanoparticles as radiosensitizers

Reference	Presenter	Authors (Institution)	Abstract
01-031	Lucas Freitas Freitas	Freitas, L.F. (Instituto de Pesquisas Energéticas e Nucleares); da Cruz, C.C. (Instituto de Pesquisas Energéticas e Nucleares - IPEN); Batista, J.G.(Instituto de Pesquisas Energéticas e Nucleares); Varca, G.H. (Instituto de Pesquisas Energéticas e Nucleares); Lugao, A.B. (IPEN); Mathor, M.B.(Instituto de Pesquisas Energéticas e Nucleares);	Gold nanoparticles present unique optical properties which are dependent upon size and morphology, and consist on a differential interaction with radiation compared to the bulk material. Those nanoparticles can be modified in order to adjust their bioavailability and tissue-targeting, and one of the means to do so is by adsorbing one or more types of proteins onto their surface. Gamma radiation can be helpful in this regard, since it promotes intra- and intermolecular crosslinks in proteins and enables their adsorption onto the metallic nanoparticles' surfaces. Here we present the results obtained for hybrid gold-protein nanoparticles as radiosensitizers. The nanoparticles were synthesized radiolytically by mixing 5 mmol L-1 NaAuCl4 with 1 mg mL-1 bovine serum albumin (BSA) or papain in the presence of 0.1 mol L-1 tert-butanol and 20% ethanol. The solutions were irradiated with 10 kGy in a multipurpose gamma irradiator (60Co source, 5 kGy per hour) for the radiolytic synthesis of the nanoparticles, and then the resulting red suspension was stored until use. 10^4 cells (MDA-MB-231 line) were seeded in 96-well plates and incubated with a 2:1 mixture of DMEM medium and nanoparticles suspension for 12 hours. Then, the wells were washed with sterile phosphate buffered saline, and fresh DMEM medium was added prior to irradiation in a gamma cell (60Co source, 0.6 kGy per hour) with 10, 30 and 50 Gy. 48 hours later, the cell viability was assessed by MTS assay. The results indicate that the radiation alone slightly stimulated the proliferation of the tumor cells, but this effect was more evident in the presence of gold-papain nanoparticles. The ablative effect due to radiosensitization was observed with 30 and 50 Gy for the cells incubated with gold-BSA nanoparticles, and 10 and 30 Gy for the cells incubated with gold-papain nanoparticles. This difference might be due to a more effective internalization or surface-attachment of nanoparticles when they are coated with papain, and one evidence for this assumption is the fact that the cell culture becomes red after the incubation with gold-papain nanoparticles. Therefore, protein-coated nanoparticles might be effective as radiosensitizers, depending on the coating and dose of radiation.

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