Efficiency Of Different Size Gold Nanorods For Optical Hyperthermia

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Introduction: Conventional treatments such as chemotherapy, radiotherapy, and surgery are the most common cancer therapies. Optical hyperthermia (OH), also called photothermal therapy, is an emerging cancer therapy [1][2] that uses gold nanoparticles to destroy the tumor cells by selectively increasing the temperature inside the cells when irradiated with a laser at an appropriate wavelength. Gold nanorods (GNRs) are capable of targeting cancer cells when biofunctionalized with molecules specifically overexpressed in cancer cells [2]. This work focuses on the elimination of tumor cells by OH in the presence of GNRs of different sizes using glioblastoma (CT2A) and melanoma (B16F10) cell lines as models, aiming to determine the best performing size.

Material and methods: In order to determine the efficiency of different sized GNRs, commercial GNRs (10x41nm), and experimental nanorods (10x40nm and 20x65nm, coated with PEG) were evaluated. CT2A and B16F10 cells were seeded at 7.000 cells/well on P96 multiwell plates. One day after seeding, GNRs were added at 2 µg/mL and then incubated for 24h. Cell cultures were then irradiated with a laser at 808nm and 4,5W for 10 min. Cell viability was determined by XTT assay and by calcein-propidium iodide staining.

Results: Heating curves after laser irradiation and cytotoxicity tests at different GNR concentrations were performed for each type of GNR in order to optimize both parameters to perform the OH. Tumor cells were eliminated when irradiated at 4.5W for 10 min in the presence of all types of GNRs at 2 µg/mL. The cell mortality obtained was high for both cell lines, being 80-90% for CT2A and 50-60% for B16F10 (Figure 1 and 2).

Conclusion: All the GNRs tested resulted as optimal nanoparticles for photothermal therapy applications, with the 20x65 nm GNRs being the most efficient, producing the highest percentage of cell death.

References

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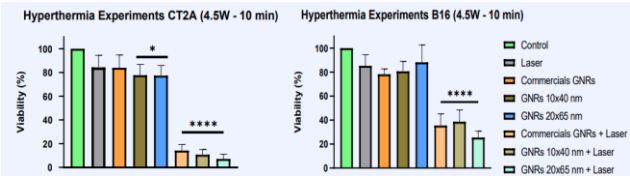

Figure 1 and 2: Cell viability of different conditions in a hyperthermia experiment (Laser, GNRs and GNRs + laser) in CT2A and B16F10. The bars represent means ± SEM of three independent samples performed in triplicate. Statistically significant differences determined by One way - ANOVA are represented: (*) p<0,05, (****) p<0,0001.