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CLAY-BASED AND MESOPOROUS SILICA NANOPARTICLES AS CARRIERS FOR PHOTODYNAMIC THERAPY

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Cancer is the second cause of human death worldwide and currently, the most common procedures against it are radiotherapy and chemotherapy. Nevertheless, both treatments damage healthy cells, and consequently, patients suffer important side effects. For that, in this work, photodynamic therapy (PDT) is proposed as a complementary cancer treatment. PDT is a minimally invasive procedure in which under suitable light irradiation a sensitive drug (photosensitizer, PS) is activated and generates Reactive Oxygen Species (ROS), mainly singlet oxygen ($^1O_2$), a cytotoxic species able to damage nearby cells. Nowadays, there are many different photosensitizers but most of them are not adequate for their use against tumors because of their poor aqueous solubility and their lack of selectivity for cancer tissues. Therefore, mesoporous silica nanoparticles (MSN) and clay-based nanoparticles are proposed as carriers for these PSs due to their excellent properties, good biocompatibility, tunable size, easy functionalization, high chemical stability, and optically transparent. [1]

In this research, these two different nanosystems were used, Laponite-clay (LAP) and Mesoporous Silica Nanoparticles (MSN), Figure 1. These carriers were decorated not only with commercial photosensitizer but also with other molecules of interest; polyethylene glycol (PEG) and folic acid (FA) to improve the stability of nanocarriers in aqueous media and the selectivity to cancer cells, respectively. [2] The final hybrid nanosystems with high singlet oxygen generation, good stability, and selectivity were tested *in vitro* in HeLa cells to demonstrate their photoactivity under specific irradiation and their viability to be used in PDT, Figure 1. [3]

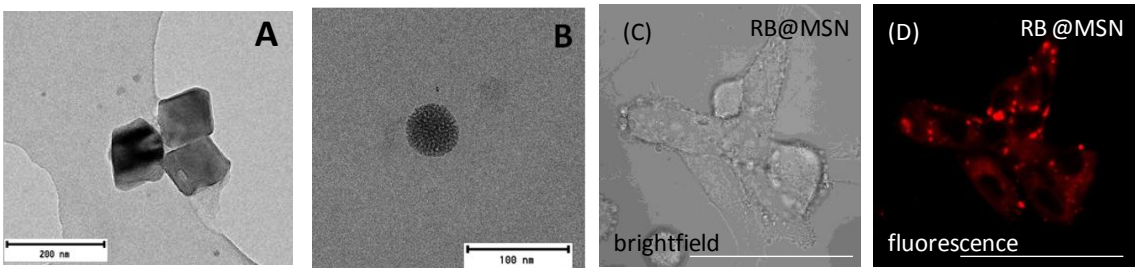

Figure 1. TEM image of LAP and MSN (A and B, scale bar 200 nm and 100 nm respectively) and fluorescence images of RB@MSNs in HeLa cells at 1 µg/mL (C and D scale bar 100 nm).

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