Fluorescence dye-silica nanoparticle for detection of cancer cells

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Cancer is the second cause of human death worldwide, and its early diagnosis is the key for an effective treatment. The most used imaging techniques, based on X-ray sources or high magnetic fields, can generate side effects in the patients. For that, fluorescence microscopy, a less invasive technique can be considered as a promising strategy to detect cancer cells by the use of suitable fluorophores. However, the most common fluorophores are not designed specifically for stain cancer cells and chemical modifications that increase the cost are required. On the other hand, the use of nanoparticles could be a more promising approach to overcome the fluorophores limitations. Mesoporous silica nanoparticles (MSN) have several benefits to be used as nanocarrier for bioimaging: high surface area, easy functionalization, good biocompatibility, optically transparent properties and low cost. [1]
In this work, mesoporous silica nanoparticles of monodisperse size distribution of around 50 nm are synthesized by modified Stöber method, Figure 1.[2] MSN was used as a carrier for a commercial dye, rhodamine 101 (R101), which was occluded inside the mesoporous of silica nanoparticles or anchored in their external surface.[3] Moreover, to ensure their good stability in water and their selectivity for cancer cells, polyethylene glycol chain and folic acid, respectively, were tethered in their external surface. As a result, well-dispersed silica nanoparticles with high fluorescence and good selectivity for cancer cells are obtained. Finally, in vitro experiments in HeLa cells were carried out to test their capability as biomarkers, Figure 1.

REFERENCES

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FIGURES

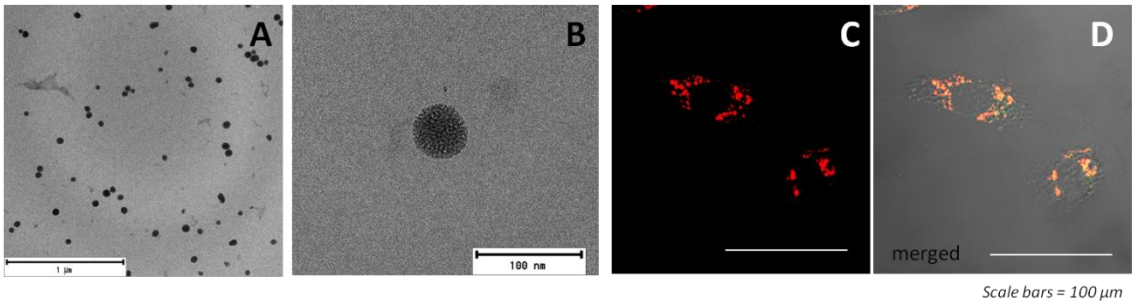

Figure 1: TEM image of mesoporous silica nanoparticles (A and B) and fluorescence images of R101-MSNs in HeLa cells at 1 µg/mL (C and D).