**Gellan-Gum Coated Gold Nanorods as Intracellular Drug Release System for Regenerative Medicine**

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**Statement of Purpose:** Due to their unique physicochemical properties, gold nanorods (AuNR) have been widely studied for biomedical applications including diagnosis, cell tracking, thermal therapy and drug delivery system (DDS) [1]. Their optical properties, their easy of synthesis, their ability to be functionalized with a wide variety of biomolecules and small molecules and their high surface area make them interesting as drug delivery carrier for regenerative medicine. However, to improve their biocompatibility and stability under biological conditions, surface modification needs to be envisaged, while enable the controlled release of drugs/bioactive agents. In this purpose, the coating of gold nanorods within hydrogel as Gellan Gum (GG), a biodegradable and biocompatible natural-based polymers [2, 3], will allow to increase dramatically the drug payload and fulfill the requirement needed to develop an efficient DDS.

**Methods:** Gold nanorods were prepared following the seed-mediated growth method [4]. Then, particles were pre-coated with a bilayer of polyelectrolytes. Subsequently, a solution of "Gelzan" Gellan Gum was previously heated at 90ºC to allow dissolution. The nanorods were added to the GG solution and the mixture was stirred overnight at room temperature. The GG-coated nanorods (AuNR-GG) have been characterized by UV-visible spectrometry, zeta potential measurements and Transmission electron microscopy (TEM). The cell viability has been performed after 1, 3, 7 and 14 days of culture using MTS assay in SAOs-2 and rabbit adipose stem cell. The internalization was characterized by TEM. The BSA-FTIC, drug model, has been adsorbed into gold nanorods suspension and then the mixture was added the GG solution overnight.

**Results:** Gold nanorods were successfully coated with a 6 nm layer of gellan gum, as shown in figure 1. The stability studies performed in different concentrations of salt and pH have demonstrated that the particles coated with the polysaccharide present a better stability in the both conditions than crude AuNR and polyelectrolyte-modified AuNRs (data not shown). The cell viability assays have shown that AuNR-GG present no cytotoxic effect over two different cell lines, after 14 days of culture. Moreover, the particles have been uptaken inside cells, aggregated in vesicles (Figure 2). The incorporation of BSA-FTIC, as drug model, and the stability of the drug-functionalized nanoparticles are significantly improved in presence of the GG (data not shown).

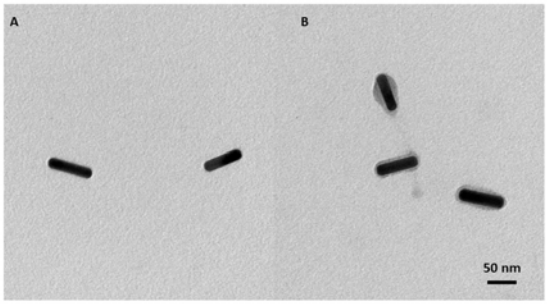


Figure 1. TEM image of: A) pre-coated AuNR and B) AuNR-GG.

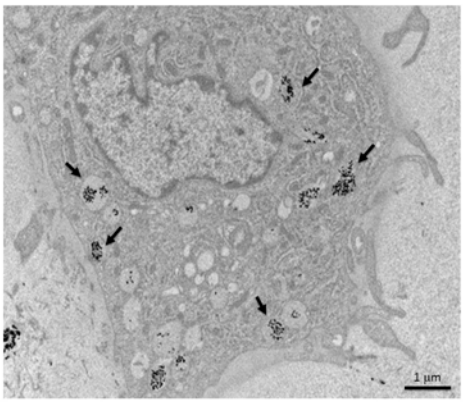


Figure 2. TEM image of an adipose stem cell, where it is possible to observe the internalized AuNR-GG (arrows).

**Conclusions:** In this study, it is reported the successful coating of individual gold nanorods within gellan gum and the ability to improve the drug-loading yield. The presence of the GG around the particles acts as a stabilizer, allowing improve its biocompatibility and stability in physiological conditions. The proposed system has shown interesting features, in agreement with DDS requirements and further will be extended for cancer therapy and tissue engineering studies.

**References:**

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