

Title: **Synthesis and characterization of functionalized gold nanoparticles to interact with biological membranes**

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Gold nanoparticles (AuNPs) have been known for centuries and throughout history they have had many different uses, especially after the scientific revolution. These nanoparticles are mainly used and synthesized in the form of a colloidal suspension of gold nanoparticles in a watery environment, hence, when we talk about this topic, we often refer to it as colloidal gold.

The interest in using these gold nanoparticles have made them a subject of numerous studies on their physico-chemical properties and the new uses that they may have in the fields of science, technology and medicine.

The main objective of this work is to synthesize functionalized gold nanoparticles that can interact with the cell membranes of humans, with the specific purpose of interacting with tumour cells so that they can be differentiated from the other cells taking advantage of the fluorescence that these nanoparticles present per se. This would allow a better detection and differentiation of the tumours, with the advantages that this presents regarding the treatment of this type of diseases. These functionalized nanoparticles, at the same time, could serve to deliver certain drugs or active ingredients to these tumours, achieving a relatively simple and effective treatment against certain kinds of cancer.

Having this horizon in mind, gold nanoparticles of different sizes have been synthesized and the stability of the obtained colloids has been studied by monitoring the colloidal stability of the most stable ones, which are those that would be suitable to be used with this purpose, through spectrophotometry and dynamic light scattering (DLS) spectroscopies. Likewise, fluorescence has also been characterized by optical microscopy.

We have tested the interaction of these unfunctionalized gold nanoparticles with binary (DPPC + cholesterol) and ternary (DPPC + DOPC + cholesterol) liposomes synthesized by electroformation in the laboratory and the observation of this interaction by fluorescence of nanoparticles, but without satisfactory results.

Finally, we functionalized gold nanoparticles with a polyethylene glycol that presents a terminal thiol group but we couldn't test their interaction with the liposomes.

Keywords: AuNPs, gold nanoparticle functionalization, lipid membrane interaction, colloidal gold stability, gold nanoparticle size, spectrophotometry, dynamic light scattering.