

GOLD NANOPARTICLES IN BIOLOGICAL MEDIA: PREPARATION AND DETECTION

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Artificial inorganic Nanoparticles can be tailored with optical, electrical and magnetic properties to use them as local nano-probes or nano-manipulators suitable for applications in biology and medicine ranging from diagnostics to therapeutics. These units combine the physical properties of the inorganic nucleus and the chemical properties of the surfactant layer, and can not be analyzed without taking this in consideration. By the very nature of the nanoparticles, the physical properties strongly depend on the surroundings and they are prone to react in biological media. While all the chemical interactions with the environment will be mediated by the molecules at the surface of the nanoparticle. Therefore, strategies for the conjugation and characterization of the nanoparticles before, during and after application is a key knowledge in developing new technologies for live sciences based in artificial inorganic nanoparticles.

We will show the use of Au nanoparticles, from its synthesis and conjugation to its final application in tagging protein aggregation processes [1] and cell internalization. The modification of the optical response of the Au nanoparticles and Protein-Coated Au nanoparticles as a function of their environment and the response of the biological media to them can be monitored by techniques such as surface plasmon resonance (Fig.1) [2, 3], transmission electron microscopy (Fig.2) and photo electron spectroscopy [4] which are not common in biology.

References:

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- [4] Bhattacharya, R.; Mukherjee, P.; Xiong, Z.; Atala, A.; Soker, S.; Mukhopadhyay, D. “Gold Nanoparticles Inhibit VEGF165-Induced Proliferation of HUVEC Cells” *Nanoletters* **4**, (2004) 2479-2481.

Figures:

Medium	AuNP	AuNP-CysPEP1	AuNP-CysPEP2
Sodium Citrate	521	529	528
Biological media ¹	531	537	537
Salts Solution ²	614	527	527

1
DMEN+FCS
2 DMEN salts
selection

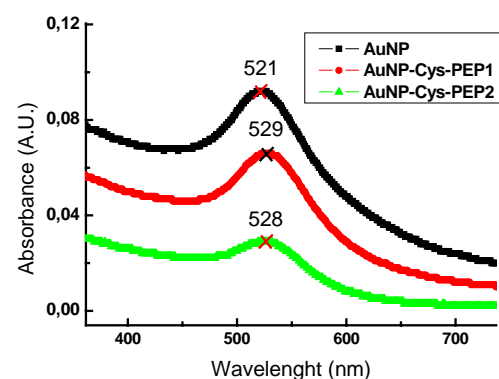


Figure 1) UV-VIS spectra of gold nanoparticles and protein-coated gold nanoparticles as a function of their environment. As a function of media (left) and as a function of coat (right).
(Wavelength in nm)

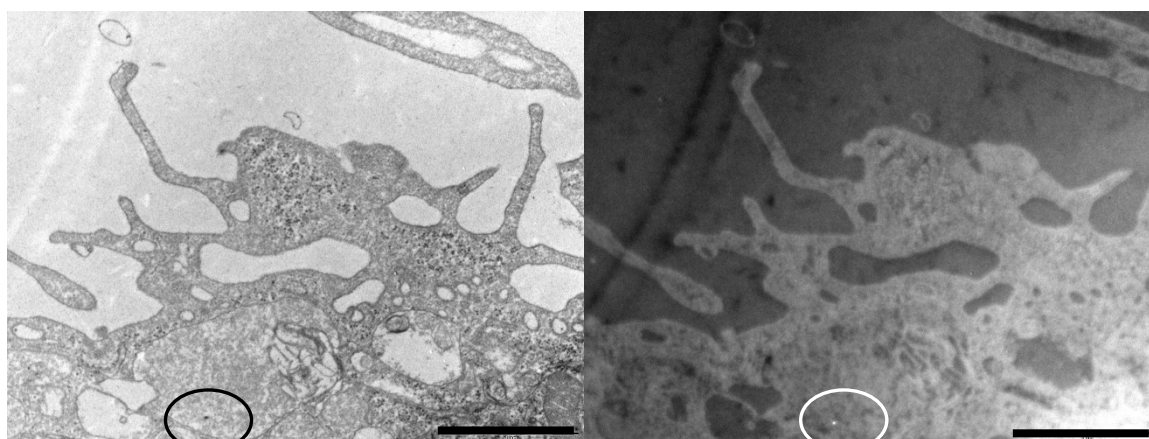


Figure 2) TEM images of macrophage cells after 30 minutes exposure in media containing gold nanoparticles conjugates: bright field (left) and dark field (right). (bar is 1 μm)