

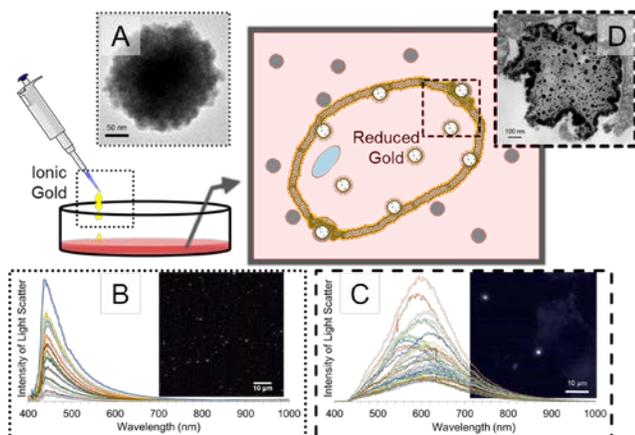
# Towards a Cell-level Personalization of Nanomedicine: Pathology Dependent *In Vitro* Reduction of Gold Nanoparticles by Action of Mammalian Cells.

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**Abstract:** Conventional nanomedicine applications are most often prevented from reaching their full therapeutic potential by immuno-suppressive physiological responses. Germinating nanosystems *in vitro* can provide a new strategy for personalized medicine, utilizing phenotypically dependent cellular machinery and being independent of typical benchtop synthesis. Here we describe a direct method to deploy ionic gold (Au) and polyethylene glycol (PEG) clusters, which are reduced to plasmonic gold through biomineralization by action of mammalian cells. This discloses the first ever to report gold nanoparticle formation directly *via* interactions with living mammalian cells. From our analysis of the Au-PEG delivery vehicle we were able to determine that the ionic gold and PEG co-clustered discretely and were in fact discrete through the electron density observed *via* TEM (figure 1A), lack of plasmonic light scattering of discrete particles *via* dark field hyperspectral imaging (figure 1B), and characteristic gold peaks *via* SEM-EDS (not pictured). Upon treatment of MCF-7 cells with Au-PEG we observe the a 'classical' gold plasmon formation through dark field hyperspectral imaging (figure 1C) as well as conformational changes of the electron density as the clusters are internalized by the cells (figure 1D). Additionally, through surface enhanced Raman spectroscopic imaging (not pictured) we were able to confirm that the reduced gold nanoparticles formed *en route* to the cells were indeed reduced solely by action of cellular biomolecules.



**Figure 1.** Schematic of ionic Au-PEG application and ensuing reduction via interactions with cells. Highlighting this schematic are the conformational changes observed through TEM (A and D) as well as spectroscopic changes from plasmon formation *via* dark field hyperspectral imaging (B and C) between ionic gold delivery vehicles (A and B) and their transition to reduced form via cellular interactions (C and D).

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