Single-Step Breast Cancer Detection Method Through Measurement of Gold Nanoparticle Adsorption to Lysine Amino Acid

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When citrate ligands-capped gold nanoparticles are mixed with a sample of positively charged proteins at pH 7, a protein corona is formed on the nanoparticle surface due to electrostatic adsorption of the proteins to the surface of the nanoparticles. Gold nanoparticles tuned to adsorb to specific cancer biomarkers, such as lysine demethylase KDM3A for breast cancer, can open the possibilities for a new blood test based on the size of gold nanoparticle-protein clusters formed due to adsorption. While dynamic light scattering and electron microscopy are reliable methods of sizing these clusters, they can be expensive and not readily available to most hospitals. An experiment was conducted to test whether the size changes of nanoparticle clusters after exposure to lysine amino acid resulted in changes in the nanoparticles' absorption spectra. The light absorption of different samples of aqueous gold nanoparticles with equal concentrations and particle sizes thoroughly mixed with several concentrations of lysine was measured with an emission spectrometer, and found to be greater across the entire visible light spectrum. This investigation thus determined that large gold nanoparticle-lysine clusters will absorb a significantly greater amount of light than gold nanoparticles alone, allowing for the blood test to be performed with simple spectroscopy. The test may be applicable for early detection of a broad spectrum of cancer. More extensive research must be conducted, but the potential for a new, simple, low cost blood test is shown by the results of this experiment.