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## Production of gold 198/199 nanoparticles for potential use in cancer radio therapy

Radiopharmaceuticals are used for the imaging and treatment of many kinds of cancer i.e. bone cancer and non-Hodgkin's lymphoma. A radiopharmaceutical consists of a targeting molecule that selectively targets certain tumors. The targeting molecule is labeled with a radioactive atom(s) that delivers a dose of radiation to the tumor. The purpose of this project is to develop a method of preparing stable radioactive Gold nanoparticles for potential radio therapeutic applications. The radioactive properties of Au-198 ( $\beta^- = 0.96$  MeV;  $\gamma = 411$  KeV) and Au-199 ( $\beta^- = 0.45$  MeV;  $\gamma = 158$  KeV) with their beta (therapeutic) and gamma (imaging) emission make them valuable candidates for both therapeutic and imaging applications. Because of the number of radioactive atoms present in a nanoparticle a much bigger dose will be delivered to the tumor than conventional methods. It is also known that tumor tissues have an enhanced permeability leading to increased cellular uptake of particles up to 400 nm in diameter. This makes Gold nanoparticles an attractive option with diameters less than 100 nm enabling dose delivery directly to the cancer cell. Such delivery methods could improve selectivity by increasing the dose concentration absorbed by the tumor versus other tissues, thus reducing potential side effects. Gold foil was irradiated for five seconds at a flux of  $8 \times 10^8$  n/cm/s. The foil was dissolved in aqua regia with heating and taken to dryness. The complex was reconstituted in 0.05N HCl to form  $\text{HAuCl}_4^-$ . Arabica gum or starch were added to the solution as stabilizers followed by a reducing agent, THPAL containing a phosphine alanine conjugate. The addition of the reducing agent resulted in a color change from yellow to a deep violet. The final solution was analyzed using spectrophotometry to determine formation of the nanoparticles. Initial data suggests that the nanoparticles are stable at room temperature in aqueous solution.