SERS nanoparticles for detection of leukemia and lymphoma cell surface proteins using Raman spectroscopy, optical microscopy and fluorescence flow cytometry

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The chemical design of surface enhanced Raman scattering (SERS) Au nanoparticles with various SERS tags, particle protection chemistries and targeting moieties was developed and evaluated for labeling of surface proteins of leukemia B cells. SERS nanoparticles were prepared using one of two strategies: by adsorbing Raman-active dye on to the surface of 60 nm spherical Au nanoparticles and coating with 5kDa poly(ethylene glycol), or by encapsulating the particles in a ternary lipid bilayer composed of DOPC, sphingomyelin and cholesterol. The Raman-active dye can be incorporated in to the lipid coated particle structure using three different strategies, and targeting proteins inserted following encapsulation. Targeting of cells by the nanoparticles was evaluated using dark field microscopy, Raman spectroscopy from cell solutions and Raman mapping of fixed cells, as well as by fluorescence flow cytometry. SERS Au nanoparticles successfully labeled surface molecules on patient derived leukemia B cells and adherent lymphoma B cell lines as evaluated using the multiple detection methods. Evidence of CD20 B cell surface protein clustering was observed. Time permitting, additional studies of protein aggregated by Raman will be introduced.