APPLICATION OF ANTIBODY-CONJUGATED GOLD NANOPARTICLES FOR OPTICAL MOLECULAR IMAGING OF EPITHELIAL CARCINOMA CELLS

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Advanced optical technologies for in vivo imaging e.g. OCT and confocal reflectance endomicroscopy while being able to image stromal morphology, are unable to image biomolecular changes associated with carcinogenesis [1]. Furthermore, the contrast between neoplastic and normal tissues from such advanced optical technologies is often too low to be of any clinical value [2]. Due to their favorable optical properties, including their ability to present potentially good contrast for reflectance-mode imaging by resonantly scattering light by surface plasmon resonance [3, 4], we are developing gold nanoparticles as optical contrast agents to perform cancer targeting bioimaging for early diagnosis of epithelial carcinoma. These changes in optical properties can be imaged using existing reflectance imaging techniques. Gold nanoparticles can be easily conjugated to antibodies or peptides through charge interaction or coordinate bonding to probe for specific cellular biomarkers with high specificity and affinity. When coupled with appropriate biomarkers such the EGFR, they may provide useful molecular specific information to assist clinicians in diagnosis of precancers. Furthermore, gold nanoparticles are generally biocompatible and benign in biological tissues and have been applied for clinical treatment of other conditions.

In this study, 20 nm gold nanoparticles were synthesized and conjugated with anti-EGFR (Epidermal Growth Factor Receptor). EGFR is a cell surface receptor biomarker that is highly expressed in majority of epithelial cancer compared to normal cells. The resulting anti-EGFR conjugated gold nanoparticles were allowed to interact with the nasopharyngeal carcinoma CNE2 cells in vitro. The exact localization of the gold bioconjugates on the cell surface EGFR receptors was investigated using confocal immunofluorescence microscopy. We have demonstrated that the binding and localization of the gold bioconjugates on the cell surface increased the reflectance and scattering properties of the CNE2 cells and provide good optical contrast for the cancer cells under confocal reflectance microscopy. Thus our study has demonstrated the potential of gold nanoparticles to target and illuminate cancer cells for bioimaging.