Title: Superparamagnetic Nanoparticles for Imaging and Therapeutics
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Description: Magnetic resonance imaging (MRI) is an appealing non-invasive approach for early cancer diagnostics and therapeutics.[1] While the imaging capabilities of these instruments have revolutionized imaging technology, the resolution of the instrument is limited to the elucidations of lesions within the body on the order of 1mm. This limitation has lead to great effort in developing contrast agents to enhance MRI capability. The goal of this research is to develop novel nanoparticle-conjugate/drug systems with combined cancer diagnostic and therapeutic functions. These "smart" nanoparticle conjugates are designed to recognize tumor-specific markers and target only individual tumor cells. These particles will enable doctors to detect tumors with MRI at the cellular level in very early stages of tumor growth and measure the therapeutic efficiency simultaneously. In our previous work, functionalized poly(ethylene glycol) silanes were developed capable of ligand immobilization via peptide bonds. Further, we have successfully immobilized folic acid to the nanoparticle surface and demonstrated negative contrast in human breast cancer cells via MRI imaging. Here, we propose to utilize this new ligand immobilization system to graft chemotherapeutic drugs including Methotrexate (MTX) and Cisplatin to create a long circulating nanoparticle drug delivery system capable of increased contrast in MRI. This new system will allow real time monitoring of drug delivery to tumor cells.