

**ABSTRACT NO.:** 527

**TITLE:** Fluorescence Resonance Energy Transfer in Quantum Dots for Medical Imaging.

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The purpose of this research project was to investigate the use of Quantum Dots (QDs) for medical imaging purposes and to determine how effective QDs were when used for medical imaging. More specifically stem cell imaging by the use of QDs was investigated and cases such as labeling of human mesenchymal stem cells and hydroxylapatite (HA) nanoparticle for in vivo imaging were compared. Mesenchymal cells of human umbilical cord can be effectively labeled with QD 655. Labeling with QD 655 allows in vivo tracking of cells even in tissues with high autofluorescence, such as the myocardium.

Quantum dots have been successfully coupled onto the surfaces of HA nanoparticles. The HA-QD interface coupling has been confirmed by transmission electron microscopy (TEM) and energy dispersive x-ray (EDX). The HA-QD suspensions have shown intensive fluorescence under various excitations. The HA-QD nanoparticles (both HA-QD600 and HA-QD800) exhibit strong luminescent emissions in non-invasive optical in vivo imaging. The image contrast has been significantly enhanced by employing quantum dots with much longer emission at near-infrared, 800 nm. These results suggest a high possibility for HA-QD to be used as an effective biomarker in biomedical diagnosis. The development of HA-QD as a non-invasive optical in vivo imaging agent hold great promise in the early detection, diagnosis, and treatment of cancer.

It was found that QDs are more suited to medical imaging than the traditional organic dyes since they offer more resistance to photobleaching, have a higher photo-stability and are easily synthesized.