NANO HIGHLIGHT
Multimodal Qdot based nanoprobe for real time noninvasive bioimaging

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Noninvasive monitoring of biological processes such as stem cell migration towards damaged or targeted regions requires highly sensitive and photostable probes. Conventional probes e.g. organic fluorescent dyes and green fluorescent protein based labels are not suitable for long time monitoring since they lack photo-stability [1]. We have recently developed multimodal QDot's (MQD)[2] in which the paramagnetic ion Gd (III) chelated onto the optical core of CdS:Mn/ZnS allows its detection by fluorescence (Fig. 1a) and Magnetic resonance imaging (MRI) (Fig. 1b).

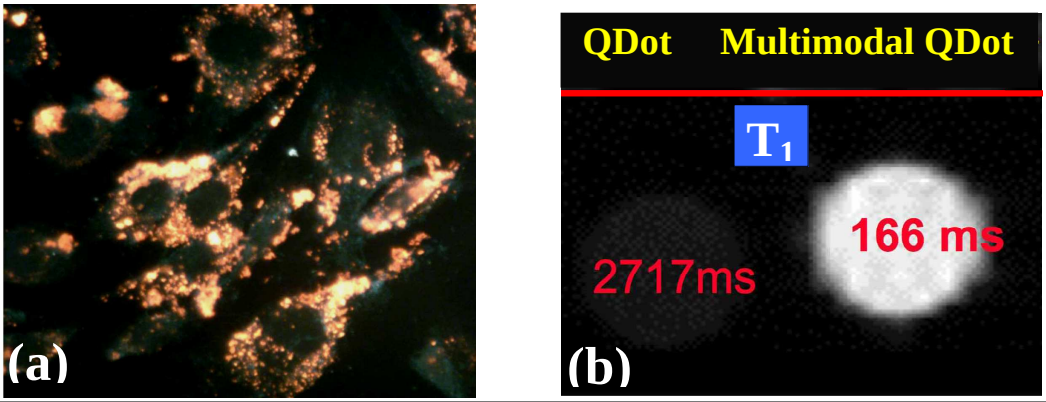
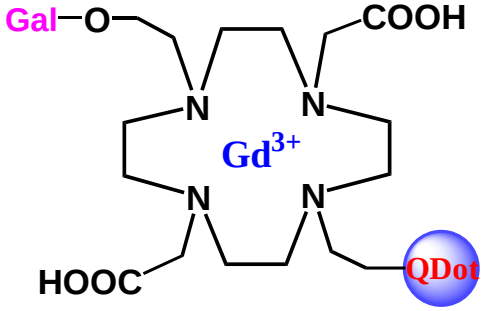


Figure 1:(a) Fluorescence emission from the MQD uptaken by the muscle derived stem cells (b) Positive T_1 contrast from MQD (right) as compared to QDots (without Gd) as control at 4.7T

One of the main objectives of the project is to develop "Multimodal Quantum dot- Beacon" (MQB) probe whose fluorescence will be used to track the translocation of stem cells and eventual differentiation will be monitored via an integrated MR contrast switch (beacon) that operates subsequent to specific gene expression-related enzymatic activity. We have carried out the synthesis of MQB in which the galactopyranose residue and QDot conjugated cyclen ligand binds to Gd (III). Currently we are conducting detailed characterization of MQB and investigating its MRI and optical properties for their future application as beacons. Experiments are underway to synthesize Near Infra-red QDot probes and improvise on the design of the MQB to allow optimum coordination for Gd (III) which results in an efficient MR contrast.



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[1] P. Sharma, S. Brown, G Walter, S Santra and B Moudgil, " Nanoparticles for Bioimaging" Advances in Colloid and Interface Science, 123-126, 471-485, 2006.

[2] H. Yang, S. Santra, G. Walter, and P. Holloway, "Gd (III)-Functionalized Fluorescent Quantum Dots as Multimodal Imaging Probes", Advanced Materials, 18, 2890-2894, 2006