



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Louis R. Li	Project Number S0411
Project Title Immunotargeted Quantum Dots for Alzheimer's Disease	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Research was conducted to develop a novel three-part approach of immunotargeted quantum dots for Alzheimer's diagnosis and treatment. The system was composed of the primary anti-beta-amyloid antibody, targeting Alzheimer's pathogenic amyloid plaques; CdSe/ZnS quantum dots, serving as semiconductor nanocrystals to emit fluorescence with detection capabilities; and the secondary antibody immunoglobulin (IgG), linking together the quantum dots and the primary antibody and allowing quantum dots to target beta-amyloid.</p> <p>Methods/Materials The secondary antibody was covalently conjugated onto the surface of the quantum dots and fluorometry using the obtained spectra was employed to determine the fluorescent yield of the reaction. The conjugated quantum dots were then characterized by agarose gel electrophoresis and viewed under an ultraviolet chamber for fluorescence monitor. Next, the proof of concept for the immunotargeted quantum dots was provided by performing a binding study of the conjugated quantum dots and the antigen, beta-amyloid, and the anti-amyloid antibody. Sequential binding was performed on a nitrocellulose membrane and rinsing of the membrane with a control of unconjugated quantum dots and two trials of conjugated quantum dots.</p> <p>Results The antibody could be successfully conjugated to the quantum dots with a fluorescence yield of 69%. The gel electrophoresis results indicated that the antibody-conjugated quantum dots migrated much slower than the unconjugated quantum dots, demonstrating the success of the chemical reaction. Finally, the binding results of the proof of concept study demonstrated that the antibody conjugated quantum dots successfully targeted beta-amyloid.</p> <p>Conclusions/Discussion A system of immunotargeted quantum dots was successfully constructed for both non-invasive, sensitive diagnosis and immunotherapeutic treatment of Alzheimer's disease. The immunotargeted quantum dots provide a strong foundation for future approaches to Alzheimer's disease.</p>	
Summary Statement A novel three-part approach of antibody-conjugated (immunotargeted) quantum dots was explored for Alzheimer's diagnosis and treatment.	
Help Received Lab used at University of the Pacific, Stockton under Dr. Xiaoling Li (experiment designed and performed independently); graduate student demonstrated how to use specific program for fluorometer	