CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
S0523

Project Title
A Contrasting Quandary: Optimizing the Signal Strengths of MRI Contrast Agents via Oligonucleotide Bridging

Abstract

Objectives/Goals
Increasing the accuracy and the range of specificity of MRI could enhance site-specific imaging and treatment. The most advantageous way to enhance site-specific imaging would be to create a magnetically decoupled T1 and T2 dual mode contrast agent. The difficulty associated with creating a dual mode contrast agent is that in the case of their direct contact, the T1 signal is quenched by the T2 signal.

Methods/Materials
In order to create a magnetically decoupled system, the distance at which gadolinium (T1) is not affected by dysprosium (T2) needs to be known. This will be achieved through oligonucleotide bridging. The two contrast agents will be bound to the opposite ends of a master strand and complementary strand respectively. At different lengths the signal strength of the T1 contrast agent will be measured.

Results
At this point in the experiment, concentrations of the samples are successfully binding into the complex predicted. This experiment will continue to progress in the future. As of now, samples which read successful on the MALDI Mass Spectrometer will be attempted to be bound to gadolinium. Then, the other complementary strands will follow, only bound to the dysprosium.

Conclusions/Discussion
What we expect to occur is as signal from the gadolinium will be quenched by dysprosium at its closest proximity, then as the ascending distance between the two contrast agents increases, the signal from the gadolinium will increase linearly with the expanding distance

Summary Statement
Optimizing the signal strengths of MRI contrast agents through magnetic decoupling via oligonucleotide bridging.

Help Received
Used lab equipment at UCSD under the supervision of Dr. Michael Hahn