MRI tracking of the distribution of medications delivered directly into the brain

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*25 REU students over the last six years, 15 publications in peer-reviewed journal and international conferences with REU authors, 6 undergraduate students for course credit, 4 IMSA students in the last three years, 8 RET fellows advised in the last three years  
**4 REU students over the last two years

The goal of this research is to predict the distribution of medications delivered directly into the brain by employing specialized MRI techniques. One of these MRI techniques is the Diffusion tensor imaging, DTI. DTI will be carried out on animals to produce a map of fluid conductivity in the brain. Then catheters will be stereotaxically placed in pre specified brain regions and a marker will be infused. Serial MRI’s will be performed and the predicted distribution will be compared to the actual distribution.

REU students will participate in scanning the animals and learn how to work within an MRI environment. The students will also run existing software at University of Chicago, Dept. of Radiology to predict various tissue distributions

A. Coronal DTI measurements of healthy 38 yr old subject  
B. Drug concentration field in anisotropic brain tissue  
C. Transmission electron micro-graph of nanoparticle

Figure 1. Clinical DTI (frame A) is used to construct accurate models for predicting drug delivery (frame B). Nanoparticles (frame C) are used for tracking drug molecules in live animal models.