Summer Student Research Program
Project Description

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PROJECT TITLE (200 Characters max):

Functional Brain Imaging and development of a new biomarker for Multiple Sclerosis

HYPOTHESIS:
The hallmark of MS is changes in the patient’s myelin, leading to changes in symptoms. Changes in myelin are difficult to document and analyze. We are developing a new biomarker for MS that uses the blood-oxygenation signal in functional brain imaging to analyze changes in the myelin. Our preliminary work suggests that this signal is sufficiently sensitive and specific to let us ‘see’ the changed myelin, enabling us to relate it to changes in patients’ symptoms.

PROJECT DESCRIPTION (Include design, methodology, data collection, techniques, data analysis to be employed and interpretation methodology)

Patients from the MS clinic are scanned by MRI; as part of their scan they will get a 5min resting state functional scan and a diffusion tensor imaging scan to analyze myelin tracts. The fmri data is analyzed by computer programs SPM99 and AFNI; signals ‘read’ in AFNI tell us: 1) where the plaque is; 2) how one piece of plaque is (may be) related to other plaque (information that is useful in predicting the patient’s prognosis) and 3) discerning ‘old’ vs. ‘new’ plaque. DTI is used to tell us how distorted the myelin is. All results are gone over with the attending neuroradiologists and neurologists.

SPONSOR’S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:

Feldman, et.al., The Blood Oxygen Level-Dependent Functional MR Imaging Signal Can Be Used to Identify Brain Tumors and Distinguish Them From Normal Tissue: AJNR 2009

Lee, Brian et.al., Bold fMRI as a Novel Biomarker for Characterizing Plaque in Multiple Sclerosis: presented at the Consortium of MS Societies, Montreal Canada 2011

IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS? 
Yes [ ] or No [x]

(IF YES, PLEASE SUPPLY THE GRANTING AGENCY’S NAME)

THIS PROJECT IS: [x] Clinical [ ] Laboratory [ ] Behavioral [ ] Other

THIS PROJECT IS CANCER-RELATED [ ]
Please explain Cancer relevance

THIS PROJECT IS HEART, LUNG & BLOOD-RELATED [ ]
Please explain Heart, Lung, Blood relevance

THIS PROJECT EMPLOYS RADIOISOTOPES [ ]
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THIS PROJECT INVOLVES THE USE OF ANIMALS □
Pending □ Approved □ IACUC Protocol #

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS □
Pending □ Approved □ IRB Protocol # M

THIS PROJECT IS SUITABLE FOR:
Undergraduate Students □ Entering Freshman □
Sopromores □ All Students □

THIS PROJECT IS WORK-STUDY: Yes □ or No □

THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR
For interested volunteers?: Yes □ or No □

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?
As future physicians, it is sometimes difficult to see the clinical relevance of research. This project bridges the gap between practice and theory. The project is clinical but uses a theoretical approach to judge a clinical situation. The student will closely interact with the attending physicians, i.e., present their results directly to the neurologists, radiologists and so apply the data that he/she is generating directly to the patient., possibly changing the way we think about their disease prognosis. Techniques like metabolic signal analysis are the cutting edge of neurological disease analysis and treatment; our work also opens up the possibilities for new ways of dealing with other brain diseases.