Summer Student Research Program
Project Description

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PROJECT TITLE (200 Characters max):

Developing Non-Invasive Radiologic Biomarkers for Brain Tumors and Related Lesions

HYPOTHESIS:
We are the only group to have demonstrated that brain tumors can be identified from surrounding normal brain by analyzing aspects of their intrinsic signals. Our hypothesis is that the signal represents a dynamic, not static, image of the tumor by averaging blood flow through the tumor coupled with its histology. In this study, we will test the hypothesis that tumors of different types and grades can be identified by their signals. This is especially important for patients with high-grade tumors who are expected to have recurrences of their cancers.

PROJECT DESCRIPTION (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology) Patients who are scanned for tumor surgery are given a BOLD functional MRI scan, as well as normal MRI, perfusion and diffusion scans. The scans are analyzed for the BOLD signals in both the tumor and normal brain areas using new brain imaging software. The signals themselves from the tumor and normal tissue are characterized using FSL. Correlations are made with the diffusion and perfusion characteristics of the tumor and then with the predominant tumor histology (from Pathology following surgery). In patient with tumor residual tumor or who have recurrences of their cancer, the signal from the original tumor is compared to that of the ‘new’ tumor or what is believed to be residual tumor. Standard statistical and correlation analyses are used to analyze the data.

SPONSOR’S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:

The Blood Oxygen Level-Dependent Functional MR Imaging Signal Can Be Used to Identify Brain Tumors and Distinguish Them From Normal Tissue. Feldman, SC; Chu,D; Schulder,M; Barry,M;Cho,E-S; and Liu, W-C. AmJ.Neuroradiology 30:389-95, 2009.

IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS?
Yes ☐ or No x ☒
(IF YES, PLEASE SUPPLY THE GRANTING AGENCY’S NAME)

THIS PROJECT IS: ☒ Clinical ☐ Laboratory ☐ Behavioral ☐ Other

THIS PROJECT IS CANCER-RELATED ☒
Please explain Cancer relevance The project is part of a long-term effort to develop non-invasive biomarkers for brain tumors and other CNS lesions. This is particularly important for high-grade brain tumors which have a very high rate of recurrence. The question of interest is whether these recurrences represent ‘new’ tumors or residual tumor; and if new, then how closely do they resemble the patient’s original tumor. Biopsies give only a rough approximation of the tumor dynamics; the BOLD signal appears to be a dynamic descriptor.

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

THIS PROJECT EMPLOYS RADIOISOTOPES □

THIS PROJECT INVOLVES THE USE OF ANIMALS □
  PENDING □  APPROVED □  IACUC PROTOCOL #

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS □
  PENDING □  APPROVED □  IRB PROTOCOL # M 0120050110- Functional Brain Mapping For Neurosurgical Patients.

THIS PROJECT IS SUITABLE FOR:
  UNDERGRADUATE STUDENTS □  ENTERING FRESHMAN □
  SOPHMORES □  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?
Medical students at the beginning of their careers are used to static images of lesions...e.g., histology. They have little appreciation for the dynamics of a tumor in its milieu, i.e., in situ. One problem is that tumor characteristics are described but their relationships to the tumor, and eventual prognosis, are unclear. Here students will have a unique opportunity to examine several aspects of a tumor and identify for themselves which ones are useful and how they are related.