Thesaurus Terms: biomaterial development /preparation, biomaterial evaluation, positron emission tomography, radionuclide, radiopharmacology, radiotracer carbon, copper, disease model, enzyme inhibitor, fatty acid metabolism, fluorine, iodine, isozyme, lead, myocardial ischemia /hypoxia, nitric oxide synthase, palmitate baboon, bioimaging /biomedical imaging, dog, laboratory mouse, laboratory rat, transgenic animal

Institution: Washington University
Lindell and Skinker Blvd
St. Louis, MO 63130
Fiscal Year: 1999
Department: Radiology
Project Start: 01-Apr-98
Project End: 31-Mar-03
ICD: National Heart, Lung, And Blood Institute
IRG: RNM

PROJECT TITLE

CHEMISTRY STUDIES

Grant Number: 5P01HL13851-360001
PI Name: Welch, Michael J.

Abstract: This project develops new labeling techniques generally applicable to the positron emitting radionuclides carbon-11 of fluorine-18. In the current proposal several areas are emphasized. These areas are: 1. The synthesis and evaluation of fatty acids labeled in 3 specific positions. 2. The evaluation of a new hypoxic imaging agent. 3. The development of new labeling agents involving carbon-11 labeled hypofluorite as a new synthon and new approaches to protein and peptide labeling of compounds with potential medical application.

Thesaurus Terms: chemical synthesis, particle accelerator, positron emission tomography, radiopharmacology, radiotracer carbon, fatty acid metabolism, fluorine, hypoxia, nitric oxide synthase, radiosensitizer baboon, bioimaging / biomedical imaging, clinical research, dog, human subject, laboratory mouse, laboratory rat

Institution: Washington University
Lindell and Skinker Blvd
St. Louis, MO 63130
Fiscal Year: 1999
Department: Radiology
Project Start: 01-Jun-76
Project End: 30-Jun-03
ICD: National Heart, Lung, And Blood Institute
IRG: HLBP

PROJECT TITLE

CORE—CYCLOTRON/RADIOCHEMISTRY

Grant Number: 5P01HL13851-369001
PI Name: Welch, Michael J.

Abstract: This core has the goal of providing radionuclides and synthetic precursors for Project 1 and radiopharmaceuticals for Projects 2-4. To this end two cyclotrons are maintained and radiopharmaceuticals labeled with oxygen-15, carbon-11 and fluorine-18. Copper-60 will be produced for a subproject in Project 1. The Core carried out the appropriate quality control testing. The Core also carries out metabolite analysis for Project 3. Developmental work will be continued on 11C-ethyliodide preparation and on the development of analytical techniques related to Project 4.

Thesaurus Terms: biomedical facility, particle accelerator, radionuclide, radiopharmacology

Institution: Washington University
Lindell and Skinker Blvd
St. Louis, MO 63130
Fiscal Year: 1999
Department: Radiology
Project Start: 01-Jun-76
Project End: 30-Jun-03
ICD: National Heart, Lung, And Blood Institute
IRG: HLBP

PROJECT TITLE

CYCLOTRON PRODUCED ISOTOPES IN BIOLOGY AND MEDICINE

Grant Number: 5P01HL13851-36
PI Name: Welch, Michael J.

Abstract: The objective of this Program Project Application is the application of positron emission tomography for the in vivo assessment of metabolic pathways in various organs, specifically the brain, heart and lung. The approach is to develop methods for the in vivo regional measurement of physiological parameters and to extend this knowledge to the understanding of basic biological processes in normal and diseased states. Compounds are labeled with the positron emitting radionuclides oxygen-15, carbon-11 and fluorine-18, produced by the cyclotrons located in the Washington University Medical Center. These radionuclides are then combined into radiopharmaceuticals which can either measure flow, metabolism or other physiological and pharmacological parameters. These radiopharmaceuticals are administered to animals or human subjects and used to measure in vivo function. The metabolic images obtained using PET are correlated with anatomical images

obtained using magnetic resonance imaging. The Program Project Grant Application includes four research projects in distinct areas all of which utilize positron tomography. The three areas are: a) synthesis and evaluation of new radiopharmaceuticals, b) neurological studies, c) cardiovascular studies; and d) pulmonary. Synergism exists between the three projects: they all share the 3 Core functions; they are all aimed at measuring metabolism and other physiological parameters in humans and image manipulation is important in all projects. The 4 Projects share the 3 Cores which provide administration, radionuclides, radiopharmaceuticals and state-of-the-art imaging devices. The Departments involved in this Program Project includes the Department of Radiology, the Department of Internal Medicine, the Department of Neurology and Neurosurgery and the Institute of Biomedical Computing.

Thesaurus Terms:particle accelerator, positron emission tomography, radionuclide diagnosis, radiopharmacology bioimaging /biomedical imaging

Institution: Washington University
Lindell and Skinker Blvd
St. Louis, MO 63130
Fiscal Year: 1999
Department: Radiology
Project Start: 01-Jun-76
Project End: 30-Jun-03
ICD: National Heart, Lung, And Blood Institute
IRG: HLBP

PROJECT TITLE

IMAGING MYOCARDIAL PERFUSION WITH NMR

Grant Number: 5R01HL57409-03
PI Name: Weisskoff, Robert M.

Abstract: DESCRIPTION (Adapted from Applicant's Abstract): The goal of this research is to develop and validate novel MR imaging approaches to quantify changes in local myocardial perfusion without the use of exogenous MR contrast media. We propose theoretical models and experimental protocols to detect, characterize and exploit changes in the intrinsic NMR signals caused by changes in the underlying physiology of the myocardium. These signals, which arise from the interaction of physical, chemical, biological and physiological variables, are subtly altered when the heart is perturbed. For example, the observed longitudinal relaxation time (T1) can be sensitized to changes in myocardial perfusion, and thus appropriately T1-weighted images can be made into quantitative perfusion maps. In addition, due to the underlying magnetic properties of oxy- and deoxyhemoglobin, the transverse relaxation times (T2*, T2) are inherently sensitive to changes in blood oxygenation. Preliminary results suggest that intrinsic NMR imaging approaches can measure myocardial flow reserve in animals and in man. In the proposed research, the investigators seek first to demonstrate that the amplitude of these changes can be predicted in a blood-perfused, ex vivo, canine heart model at 4.7 T, in which the important underlying physiological parameters (blood flow and volume, blood oxygenation, and hematocrit) can be controlled or measured. Following optimization of image quality at 1.5 T, they seek to exploit these changes to produce quantitative maps of the results of vasodilatory (adenosine) stress, in an intact porcine model that includes flow limitation via coronary artery stenosis. They hypothesize that they can measure local myocardial flow reserve using either T1 or T2/T2* effects under vasodilatory challenge: T1 changes can be directly interpreted as flow changes, whereas the T2 changes are the result of an increase in blood oxygenation due to the increased flow with minimal increased oxygen consumption. The applicants will optimize the imaging methodologies, determine which method more robustly detects deficits in perfusion reserve in animal models of coronary artery disease and demonstrate its feasibility in normal human subjects for subsequent studies in patients with suspected coronary artery disease.

Thesaurus Terms: blood flow measurement, diagnosis design /evaluation, heart circulation, heart scanning, myocardium, nuclear magnetic resonance spectroscopy artery stenosis, biomechanics, blood volume, computer simulation, dipyridamole, disease model, heart function, hemodynamics, image enhancement, model design /development, oxygen consumption, vasodilation bioimaging /biomedical imaging, clinical research, dog, human subject, magnetic resonance imaging, outcomes research, swine

Institution: Massachusetts General Hospital
55 Fruit St
Boston, MA 02114
Fiscal Year: 1999
Department:
Project Start: 01-Aug-97
Project End: 31-Jul-00
ICD: National Heart, Lung, And Blood Institute
IRG: RNM

PROJECT TITLE

QUANTITATIVE MAGNETIC RESONANCE ASSESSMENT—MICROVASCULAR DYSFUNCTION

Grant Number: 5R01HL58876-03
PI Name: Wilke, Norbert

Abstract: DESCRIPTION (Adapted from Applicant's Abstract): With the advent of coronary angiography a unique group of patients was identified with classic symptoms of