CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP130604

Project Title:
Imaging cancer with radiofluorinated organoboron/biomolecule conjugates

Award Mechanism:
High Impact/High Risk

Principal Investigator:
Gabbai, Francois

Entity:
Texas A&M University

Lay Summary:

The overall goal of this project is the discovery of novel methods for the preparation of radiopharmaceuticals which will be used to image cancer by Positron Emission Tomography (PET) using the positron emitting fluorine isotope 18F as a radiotracer. The use of this isotope is attractive because it can be easily prepared by proton bombardment of [18O]-water. Despite these advantages, 18F undergoes a rapid nuclear decay, making its incorporation into cancer-imaging agents a race against time. As an added complication, irradiation of [18O]-water produces [18F]-fluoride ions whose reactivity is lowered by the aqueous nature of the media. Thus, to minimize deactivation of the radiotracer, the [18F]-fluoride incorporation step should be compatible with aqueous media, rapid, high-yielding, and implemented in the late stages of the imaging agent synthesis. To tackle these challenges, we propose a research program centered on the use of boron derivatives that display a high affinity for fluoride anions. These zwitterionic derivatives will possess a negatively charged aryltrifluoroborate moiety juxtaposed with a positively charged group. The latter will act as an electrostatic anchor for the oppositely charged fluoride anion, making the capture of [18F]-fluoride ions possible in aqueous solutions. These fluoride captors will be decorated by pendant functional groups which will be used to generate imaging agents by attachment of cancer-targeting molecules. The project will culminate with a series of in vivo PET imaging experiments using tumor bearing mice. The experiments will demonstrate the validity of our “late-stage aqueous radiofluorination” approach to the preparation of PET cancer-imaging agents. By eliminating technological obstacles that currently hamper the field of PET cancer imaging, we expect that this research project will have a transformative effect on cancer diagnosis and patient management.