2016/2017 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on 4 July 2016

Supervisor Information (First named supervisor will be the contact):	
First Supervisor's Name and Title: Assoc Prof Nigel Anderson	
Department - UOC &/or CDHB (if applicable): Radiology, UOC	
First Supervisors Phone: 021 226 7711	First Supervisors Email: nigel.anderson@otago.ac.nz
First Supervisors Mailing Address: Radiology and Centre for Bioengineering, UOC, 2 Riccarton Ave, ChCh	
Co-Supervisors Name and Title(s): Dr Aamir Raja, Dr Peter George	

Research Category (Choose one category only **– to be used for judging the students' presentations):**		
Clinical	Laboratory X	Community

Project Title (20 words MAXIMUM):
Fatty liver - measuring fat content for noninvasive imaging with MARS spectral

Project Description:

Introduction:

There is an epidemic increase in the prevalence of nonalcoholic fatty liver disease (NAFLD), affecting 10%-30% of adults. It is the precursor to cirrhosis and primary liver cancer. Invasive liver biopsy is used to determine liver fat content. Currently 1H-MR spectroscopy is the most sensitive technique for the non-invasive identification of excessive fat accumulation and limited quantification, however MR imaging is expensive and not all hospitals or research institutions have access to it. MARS spectral is a new multi-energy Xray imaging modality which can determine the Xray spectral signature of different material and tissues to identify and quantify the material. By employing this capability to measure lipid, we can identify liver fat content of fatty liver samples. In this project, the student will use MARS CT to measure fat content (from 5%-70%) in a range of mouse livers obtained from genetically modified mice which develop severe fatty liver disease and its complications which include metabolic syndrome, atherosclerosis, cirrhosis, and liver cancer.

Aim:

1. Quantify fat content within excised mouse livers using MARS spectral
2. Validate findings using biochemical techniques.
3. Quantify liver fat content in a whole mouse (if time).

Possible impact (in lay terms):

This project is to determine proof of concept for measuring fat content of the mouse liver noninvasively. This could be a useful tool to use in a mouse model to test efficacy of methods to prevent fatty liver disease progressing to irreversible cirrhosis. Once a human MARS scanner is built in a few years, measuring fat in the liver and monitoring the efficacy of therapy could be trialled. This could herald a tool for diagnosing fatty liver disease and treatment. It could facilitate better treatments for fatty liver disease.

Method:

Initially, the student will prepare a calibration phantom with samples of varying lipid content that is scanned with MARS so that a calibration curve for lipid can be developed. The student will learn how to scan the phantom, then stored excised livers from mice with and without fatty liver. The student will measure lipid content from the images using in-house software. Once scanning and image analysis is complete, the validation procedure commences. Lipids will be extracted from the livers, then examined for cholesterol and neutral lipid content. Depending on time left, and success with the validation technique, the student may measure liver fat content in the scan of a euthenised whole mouse.