PROJECT TITLE: Establishing an early and sensitive cardiac biomarker for heart attack

Sakthivel Sadayappan, PhD, MBA
Professor of Internal Medicine
Associate Chairman for Basic Research, Internal Medicine
Director of Heart Branch of the Heart, Lung and Vascular Institute
Division of Cardiovascular Health and Disease, College of Medicine
University of Cincinnati
Cardiovascular Center, Rm 4935
231 Albert Sabin Way
Cincinnati, OH 45267-0575, USA
Phone: +1 513-558-7498
FAX: +1 513-558-2884
Email: sadayasa1@ucmail.uc.edu

Project Description

1. Area of research
The long-term objective of the study is to develop a diagnostic serological test to determine the level of cardiac myosin binding protein-C. It would be designed as a practical clinical tool to detect the presence of early ischemia which would, in turn, indicate critical coronary artery stenosis. It could also be used to monitor cardiac function post-heart attack. Such test would be helpful in diagnosing patients at risk of heart attack before its occurrence, but would also help guide treatment post-heart attack.

2. Research tasks the student will be performing
Undergraduate students will perform ELISA (enzyme-linked immunosorbent assay), which is a 96-well plate-based assay technique to measure the level of serum biomarkers. Students will first learn lab biosafety protocols, followed by learning standard laboratory techniques, such as molarity calculations, buffer preparations, and pipetting, as well as documenting and reporting results. ELISA will include generating standard graph, determining inter- and intraplate variations, defining upper (ULOQ) and lower limits of detection (LLOD), upper (ULOQ) and lower limits of quantitation (LLOQ), and calculating interassay accuracy (percent relative error, %RE), percent total error (%TE), percent analytical recovery (%AR), percent coefficient of variation (%CV), and the area under the receiver operating characteristic.
(ROC) curve to define the sensitivity and specificity of the biomarker for heart attack.

3. Training that the mentor will provide to the WISE student
The objective of the twelve-week Women in Science and Engineering (WISE) Program is to expose undergraduate women to cardiovascular basic research. Heart failure is the number 1 killer worldwide. This calls for increasing research activities and novel discoveries to prevent and cure heart disease, as well as recruiting qualified women in science and engineering who can perform these tasks. We hypothesize that undergraduate students can supply this demand, as the upcoming innovators who will bring new ideas and technologies to the fight against CVD. As proposed in this study, students will be exposed to systematic and critical thinking, planning, teamwork, experimental design and documentation thereof. They will learn how to review the pertinent literature, ask relevant questions, and develop an appropriate hypothesis. They will learn how to perform experiments in a rigorous and reproducible manner. In addition, students will be asked to attend research seminars and present the results of their studies at lab meetings. Overall, the WISE training plans will include orientation, hands-on research experience, weekly discussions of projects, weekly journal club, workshops on pertinent research tools, and poster presentations at the one-day local College of Medicine symposium.

4. Specific requirements, if any, that the mentor expects the student to meet
We prefer students who are highly motivated and interested in cardiovascular research since this is our primary focus.