

NUACIS's , Heart Center of Niagara Research Collaboration on Coronary Artery Disease

Niagara University and Niagara Falls Memorial Medical Hospital's Heart Center of Niagara have entered the ranks of the nation's cutting-edge coronary artery disease (CAD) research, a move that will strengthen the Western New York region's economy and pay long-term dividends for victims of cardiac disease across the United States.

The ability to make this quantum leap is the result of an exciting working relationship that Niagara University's Academic Center for Integrated Sciences (NUACIS) has forged with the Heart Center of Niagara, Positron Corp. GE Healthcare, and the University at Buffalo, to conduct research that will evaluate the use of biomarkers and biological and molecular mechanisms for the diagnosis and treatment of CAD. At the same time, Buffalo Niagara Enterprise (BNE) – a private, nonprofit corporation based in Buffalo – will work with Niagara University and local businesses, including pharmaceutical companies and medical equipment manufacturers, to commercialize inventions and discoveries that may result from this research. That effort will translate into new jobs for Niagara County and the surrounding region.

Research done by Heart Center Medical Director Michael Merhige, M.D., a clinical associate professor of nuclear medicine at the University at Buffalo, has shown the standalone use of non-invasive Positron Emission Tomography (PET) scans can reduce the percentage of patients needing invasive coronary arteriograms without adversely affecting patient outcomes. Research started in August, 2005 by Drs' Robert Greene and Deborah Leonard of NUACIS has already indicated the usefulness of genetic biomarkers to identify patients with coronary artery disease. Results of these studies have been peer reviewed and presented at 4 national research meetings and four regional undergraduate research symposia.

Niagara University is well equipped for this venture, thanks to the new Academic Center. Lead by Dr. Robert Greene, Professor of Biology and Academic Director of the Center, and Dr. Mary McCourt, Director of Applied Research for the Center the \$5.5- million Center is an initiative between New York State and the university. To date, the Center has received \$2.5 million from the Office of Science, Technology, and Academic Research through the GenNYsis program and the University is matching that with \$3 million from the university and private fundraising. With that funding, NUACIS has developed and equipped six new laboratories; including a state of the art Confocal laser microscopy, microarray and molecular modeling and bioinformatics computing facilities. New academic programs in bioinformatics and computational chemistry have been developed to train undergraduate students in the scientific disciplines that are much in demand in the Western New York.

Specific research projects underway at NUACIS are focused on the biomarkers and biological and molecular mechanisms involved in coronary artery disease. Coronary artery disease (CAD) remains the number one killer of Americans, taking 720,000 lives in 2000 alone. Given that half these deaths were unheralded by any symptoms, it is clear that more accurate, more accessible, non-invasive modalities must be available to identify patients at significant risk for death or disability due to CAD. PET myocardial perfusion imaging has shown dramatic abilities

to identify reduced myocardial blood flow. In a recent Heart Center study patients with reduced coronary blood flow showed a clustering into three groups of responders after aggressive medical management post diagnosis. Approximately 22% showed improved PET of CAD, 54% showed stabilization of CAD, while 24% showed a deterioration of CAD.

Experimental protocols currently underway at NUACIS's are targeting a broad spectrum of genetic, protein, metabolic and psychological biomarkers. Six research projects involving 11 faculty and 49 students are focused on CAD using both in vivo (patients) and in vitro (laboratory) approaches are briefly described below.

1. Genomics, Genotyping and Bioinformatics: results have identified several genes and genotypes in patients that may prove to be early markers for CAD. This could lead to a simple blood test for early risk detection and treatment monitoring.
2. Environmental pollution and CAD: results have demonstrated a correlation between environmental pollution and high CAD incidence in some WNY geographical areas. These preliminary results could be linked to cause and effect in CAD.
3. Foam cells and atherosclerosis in CAD: in vitro (test tube) model system allows testing of in vivo (patient) hypothesis for cause and effect, molecular and cellular mechanisms, and possible treatment protocols and drug development for CAD.
4. Psychological Stress and CAD: is currently evaluating stress factors in CAD patients. Results could lead to better understanding the psychology of CAD in WNY and thus to better mental health treatments for CAD patients.
5. Proteomics and CAD: results will show biomarkers of CAD at the level of protein synthesis, complimenting and supporting the DNA gene and genotype marker. This will expand our knowledge base of disease development and treatment effects in CAD.
6. Metabolomics and CAD: results will interaction between metabolic products in CAD patients and how this correlate with disease state and treatment effects.

Thus Niagara University's Academic Center for Integrated Sciences, in partnership with The Heart Center of Niagara, will continue to grow and develop common goals in research and education that help to foster a healthier and more robust population and economy in Niagara County and Western New York. The collaboration will actively create the circumstances necessary for Niagara students to engage in cutting edge research with their professors and health practitioners. Doing so will provide significant research and learning opportunities and, in this particular case, the ability to apply the knowledge that is gained to finding better treatments and solutions for the Buffalo Niagara communities major health problems, coronary artery heart disease.

NU Heart Center of Niagara Partnering on Coronary Artery Disease Fact Sheet

- Coronary artery disease (CAD) is the #1 killer in America
- Niagara County and the Buffalo Niagara region have the highest incidence of CAD in the nation
- Circumstance creates the best patient study population for CAD
- Heart Center Positron Emission Tomography (PET) non-invasive diagnostics reduces cost and death rate in CAD
- 600 patient blood samples collected for gene studies by NU faculty researchers and student
- Creating a unique DNA, blood and protein library at NU for CAD studies
- Collaboration between NU and Heart Center establishes a bedside to bench and back to the bedside clinical and basic sciences treatment and research dynamic
- NU/Heart Center dynamic is interdisciplinary involving 17 faculty/clinicians and staff and 49 students to date
- Outcomes of the research will significantly impact Buffalo Niagara community health and wellness
- Current research underway in NU/Heart Center partnerships:
 - :PET & CT non-invasive studies of CAD
 - :epidemiology and CAD
 - :genomics, genotyping, bioinformatics of CAD
 - :environmental pollution and CAD
 - :model cell culture system in CAD
 - :psychological stress in CAD
 - :proteomics and CAD
 - :metabolomics, computational chemistry in CAD

- Other collaborating institutions and corporations
 - :Positron Corp
 - :GE
 - :UB
 - :RPCI
 - :HWI
 - :BNE