

## PRESS RELEASE

### Next Generation Cardiac Diagnostics Using Saliva-Based Nano-Bio-Chip Sensors

It's the middle of the night when you suddenly feel pain in your chest. You try to ignore it at first, but your chest pain has you scared and worried. Could you be having a heart attack? Should you wake up your tired spouse? Should you go to the emergency room? Or is this pain simply derived from another false alarm. Unfortunately, to many Americans, the decision to seek rapid treatment in this situation is not clear-cut. Many heart attack victims, especially women, experience nonspecific symptoms and many heart attack victims secure medical help too late after permanent damage to the cardiac tissue has occurred. New saliva-based nano-bio-chip tests presented this week by a multi-University team promise to dramatically improve the accuracy and speed of cardiac diagnosis, at a fraction of the cost of an emergency room visit. These new tests, which could analyze a patient's saliva on board an ambulance or at a neighborhood drugstore, are nothing to "spit at".

According to a recent report by the American Heart Association (*Rosamond et al. Circulation, 117 (4): 2008*), cardiovascular disease remains the leading cause of death in the developed countries, including the United States of America. Coronary artery disease (CAD), the precursor to many heart attacks, caused 1 of every 5 deaths in the United States in 2004. In 2008, an estimated 770,000 Americans will have a new coronary attack, and about 430,000 will have a recurrent attack. Here, about every 26 seconds, an American will have a coronary event, and about every minute someone will die from one.

Worse, it is estimated that an additional 175,000 first heart attacks go undetected each year. This troubling statistic indicates a need to more effectively diagnose cardiac disease. Recently, a number of serum proteins have been identified as significant contributors to cardiac disease. Some have been approved by the FDA for application in the clinical laboratory to assess future risk of heart attacks for apparently healthy individuals and others (such as the TRIAGE panel) are used in the emergency room setting to diagnose the occurrence of a heart attack. However, the question still remains: can we do better? Can we diagnose future risk at an earlier stage and can we identify a cardiac event before the patient even gets to the hospital?

Recent scientific developments from a team in Texas and Kentucky suggest that earlier diagnosis of a heart attack may indeed now be possible using only a few drops of saliva. In a recent (April 4, 2008) meeting of the American Association of Dental Research (AADR) in Dallas, the interdisciplinary research team from The University of Texas at Austin, University of Kentucky, University of Louisville, and The University of Texas Health Science Center at San Antonio reported the first use of saliva in cardiac diagnostics. Their work, supported by an innovative program funded by the National Institute of Dental and Craniofacial Research at the National Institutes of Health (<http://www.nidcr.nih.gov/>), was presented in a series of talks describing the identification of proteins in saliva with cardiac diagnostic utility and the application of a portable, simple and cost-effective sensor device for their measurements.

Leveraging microelectronics components and microfabrication developed initially for the electronic industry, the group of scientists and clinicians have developed a series of compact nano-bio-chip sensor devices that can be made in cost effective ways while at the same time yielding ultra-powerful diagnostic capabilities. The nano-bio-chip sensors are biochemically programmable and, as such, can be fashioned to detect any set of proteins in saliva that offer diagnostic utility. The same group of clinicians and scientists have identified just such diagnostic panels for identifying a patient's risk for primary cardiac events as well as for diagnosing an actual heart attack when it happens. The nano-bio-chip sensor assays, which contain all necessary reagents on a device the size of a credit card, produce equivalent results to clinical laboratory blood tests in as little as 15 minutes using a few drops of saliva.

These exciting new scientific findings may signal that a new era in cardiac diagnostics is emerging. Indeed, the use of saliva, as a non-invasive diagnostic medium, with a portable nano-bio-chip sensor device opens up new avenues of cardiac care. Results achieved with this approach generate diagnostic information for cardiac disease that appears equivalent to traditional blood-based tests, only now this testing can be more accessible to the patient, the ambulance crew, or the nearby pharmacy for the diagnosis of a heart condition. Similarly, a nano-bio-chip-based test may be applied in broader healthcare settings, for example the dentist's office, for early identification of cardiac risk, using saliva as the diagnostic medium. This work extends prior efforts of the same team whereby integrated separation, collection and detection devices are the basis for nano-bio-chip-based HIV monitoring systems in resource-poor settings (such as in Botswana, Africa). The work has led to a new Austin based company called *LabNow* that is taking these highly affordable sensor systems into Africa where there is now a desperate need for HIV immune function tests. With the same basic platform system, the new saliva-based biological signatures of cardiac disease can be obtained quickly, without drawing blood, and efficiently delivered to the Emergency Department personnel or the cardiologist, even before the patient gets to the hospital.

The above activities were completed at University of Texas at Austin (UT Austin) {Principal Investigator for the program: Dr. John T. McDevitt, lead investigators: Dr. Nicolaos Christodoulides and Dr. Pierre N. Floriano}; the University of Texas Health Science Center at San Antonio {lead investigators: Dr. Chih-Ko Yeh and Dr. Spencer Redding}; the University of Kentucky {lead investigators: Dr. Craig Miller, Dr. Michael J. Novak and Dr. Jeff Ebersole}; University of Louisville {lead investigator: Dr. Denis Kinane}. Through this NIH U01 Cooperative Research program, UT Austin and its clinical-dental collaborators have partnered with Austin-based LabNow, Inc ([www.labnow.com](http://www.labnow.com)), in an effort to translate the bench-top discoveries into real-world clinical devices. LabNow is a start-up venture that has licensed the lab-on-a-chip technologies pioneered at UT Austin. LabNow's first product is an HIV immune function monitoring test. New tests developed through this U01 program will allow LabNow to expand its platform to include other important tests that are of strong clinical utility.