

Saliva Can Help Diagnose Heart Attack

Wednesday, April 16, 2008

AUSTIN, Texas—Early diagnosis of a heart attack may now be possible using only a few drops of saliva and a new nano-bio-chip, a multi-institutional team led by researchers at The University of Texas at Austin reported at a recent meeting of the American Association for Dental Research.

The nano-bio-chip assay could some day be used to analyze a patient's saliva on board an ambulance, at the dentist's office or at a neighborhood drugstore, helping save lives and prevent damage from cardiac disease. The device is the size of a credit card and can produce results in as little as 15 minutes.

"Many heart attack victims, especially women, experience nonspecific symptoms and secure medical help too late after permanent damage to the cardiac tissue has occurred," says **Dr. John T. McDevitt**, principal investigator and designer of the nano-bio-chip. "Our tests promise to dramatically improve the accuracy and speed of cardiac diagnosis."

McDevitt, a professor of chemistry and biochemistry at The University of Texas at Austin, collaborated with scientists and clinicians at the University of Kentucky, University of Louisville, and The University of Texas Health Science Center at San Antonio.

McDevitt and his collaborators took advantage of the recent identification of a number of blood serum proteins that are significant contributors to, and thus indicators of, cardiac disease.

Leveraging microelectronics components and microfabrication developed initially for the electronic industry, they developed a series of compact nano-bio-chip sensor devices that are biochemically-programmed to detect sets of these proteins in saliva.

Researchers from the University of Kentucky College of Dentistry tested saliva from 56 people who had a heart attack and 59 healthy subjects for 32 proteins associated with atherosclerosis, thrombosis and acute coronary syndrome. They found these proteins were in higher concentrations in saliva of heart attack victims, and that specific salivary proteins were as accurate in the diagnosis of heart attack as those found in blood serum using current testing methods.

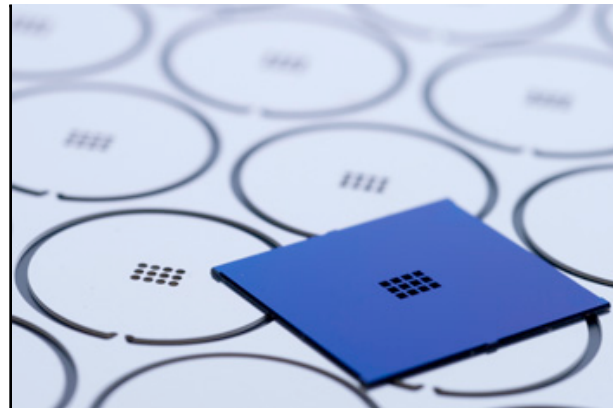
"These are truly exciting findings, since use of these tests could lead to more rapid diagnosis and faster entry of patients into treatment scenarios that can save lives," says Dr. Craig S. Miller, of the Kentucky team.

The test can reveal that a patient is currently having a heart attack necessitating quick treatment. It can also tell a patient that they are at high risk of having a future heart attack.

The new diagnostic test works like this: A patient spits into a tube and the saliva is then transferred to a credit card-sized lab card that holds the nano-bio-chip. The loaded card is inserted like an ATM card into an analyzer that manipulates the sample and analyses the patient's cardiac status on the spot.

"What's novel here is our ability to measure all such proteins in one setting and to use a noninvasive saliva sample, where low protein levels make such tests difficult even with large and expensive lab instruments," McDevitt says.

Cardiovascular disease is the leading cause of death in developed countries, including the United States. In 2008, an estimated 770,000 Americans will have a new coronary attack, and about 430,000 will have a recurrent



Nano-bio-chips like this one made of silicon (in blue) can be used to test saliva for characteristics of heart disease. The round objects in back are nano-bio-chips microfabricated from sheets of stainless steel, making them about 100 times cheaper than silicon. Photo by Glen Simmons.

attack.

"There is certainly a strong need for more effective early diagnosis of cardiac disease," says McDevitt.

The new technology is still in the clinical testing phase, but it is a strong candidate for further commercial development through the Austin, Texas company LabNow, Inc., a start-up venture that licensed the lab-on-a-chip technologies from The University of Texas at Austin. LabNow's first lab-on-a-chip product, now in development, targets HIV immune function testing and can be used in resource poor settings like Africa.

Lead investigators from The University of Texas at Austin are Drs. John McDevitt, Nicolaos Christodoulides and Pierre N. Floriano. The University of Texas Health Science Center at San Antonio lead investigators include Drs. Chih-Ko Yeh and Spencer Redding. Lead investigators at the University of Kentucky are Drs. Craig Miller, Michael J. Novak and Jeff Ebersole. University of Louisville lead investigator is Dr. Denis Kinane.

This research is supported by the National Institute of Dental and Craniofacial Research at the National Institutes of Health.

Written by: *Lee Clippard*

For more information contact:

Dr. John McDevitt; mcdevitt@mail.utexas.edu,
512-471-0046; Lee Clippard, public affairs, 512-232-0675,
lclippard@mail.utexas.edu; Ann Blackford, 859-323-6363
ext. 230, ann.blackford@Uky.edu

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