

## Capillary-based assay for cardiac markers with cantilever platform

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Heart attack is a problem that runs rampant across North America. Each year approximately 70,000 heart attacks occur in Canada [1-2], which translates to one heart attack every 7 minutes and costs the Canadian economy \$20.9 billion each year. In 2010-2011, there were approximately ~300,000 hospitalizations due to heart diseases [1]. This number is increasing at an alarming rate due to many reasons related to sedentary life style [2]. Most of the deaths reported are due to the lack of prior diagnosis of heart damage and/or ignorance due to patient's unawareness of cardiac symptoms [1]. Heart attack, also known as myocardial infarction or acute myocardial infarction (AMI), is the death of heart muscles due to insufficient supply of oxygen carrying blood [2]. It has been found that the concentration of certain proteins and/or enzymes increases in the blood serum after infarction [2]. The cardiac proteins, such as myoglobin, troponin I, troponin T, CK-MB, fatty acid-binding protein (also known as H-FABP), and isoenzymes, appear in the blood serum after AMI [2].

In the present work, we have developed a rapid, accurate, label-free and highly sensitive detection system for monitoring the levels of different cardiac markers from a small amount of blood serum. Here, we used cantilever array for the simultaneous detection of cardiac markers (Myoglobin, Troponin I, Troponin T and CK-MB). Several researchers used cantilever arrays for the detection of biomarkers [3-5]. In the present work, capillary-based functionalization is developed for immobilizing the respective antibodies of cardiac markers on gold-coated top surface of the cantilever. Functionalized cantilever array chip is integrated in a microfluidic system, which allows flow of blood serum on the surface of the cantilever array. Cardiac markers (antigens) in the blood serum react with respective antibodies available on the cantilever array. Because of this antibody-antigen reaction, the mass on the cantilever changes and shows a deflection in the cantilever, which will be detected using a highly sensitive optical system for quantification of the antigens.

This approach of simultaneous detection of different cardiac markers will facilitate the rapid and early diagnosis of heart attacks.

### Reference:

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- [4] M. Alvarez, and M. Lechuga, *Analyst*, 2010, *135*(5), 827-836.

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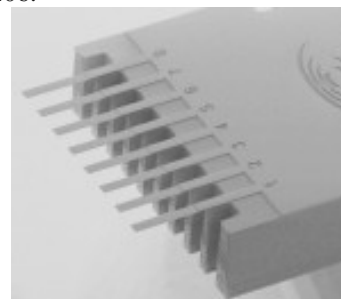


Fig.1 Microcantilever array (8 cantilevers) made up of silicon and coated with gold purchased from Micromotive GmbH, Germany)

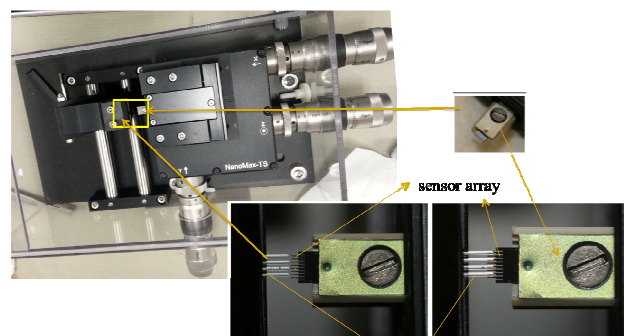


Fig.2 Cantilever functionalization system for immobilizing the respective antibodies of cardiac markers (concentris GmbH, Switzerland.). Four cantilevers are immobilized with antibodies and other four cantilevers are used as reference.