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Detection of Traumatic Brain Injury Protein Biomarkers with Resonant Microsystems

A portable, high-sensitivity resonant microsystem enables rapid, label-free diagnosis of traumatic brain injury (TBI) and other conditions using minimal fluid samples.

Microelectromechanical resonators enable sensitive, inexpensive detection of biomarkers, which are indicators of specific diseases, infections, or other medical conditions. However, the detection of s100B, a protein biomarker secreted in the presence of a traumatic brain injury (TBI), is a difficult task to manage. There are numerous methods for identifying biomarkers, but most dependable methods are cumbersome and involve multiple, time-consuming steps that severely limit on-site diagnosis. There is need for a method of detecting biomarkers easily and practically.

Researchers at Purdue University have developed a novel functionalization technique that utilizes a piezoelectrically induced resonant microsystem, a promising medical diagnostic tool with high sensitivity. A plate-style resonator is used to sense biomarkers, including s100B, by detecting changes in mass due to biomarkers. The mechanical resonator demonstrates simple, yet powerful sensor functionality. This could be a feasible solution for successfully diagnosing potential TBI victims at the time of injury.

Advantages:

-Mechanical, label-free sensing

-Provides high-sensitivity sensing in a fraction of the time

-Portable, can use on-site

-Requires only a small amount of fluid for testing

-Allows for dry sensing, which is advantageous for single-use/on-site diagnostic applications

Potential Applications:

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Category
Biotechnology & Life Sciences/Biomarker Discovery & Diagnostics
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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-Medical tools for TBI diagnosis

Related Publications:

-Nikhil Bajaj, et al. Design and Implementation of a Tunable, Duffing-Like Electronic Resonator via Nonlinear Feedback. Journal of Microelectromechanical Systems, Volume 25, Issue 1, February 2016, pp. 2-10. DOI: 10.1109/JMEMS.2015.2493447

-Vijay Kumar, et al. Bifurcation-based mass sensing using piezoelectrically-actuated microcantilevers. Applied Physical Letters, Volume 98, 153510, April 2011. DOI: 10.1063/1.3574920

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