Ahmed Touhami, J Biosens Bioelectron 2014, 5:3
http://dx.doi.org/10.4172/2155-6210.S1.019

OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference and Exhibition on
Biosensors & Bioelectronics
August 11-13, 2014 Hilton San Antonio Airport, San Antonio, USA

Atomic force microscopy and biosensing, from nanoscale imaging to nanobiosensors

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With its ability to observe, manipulate and explore the structures and dynamics of biological systems at subnanometre resolution, atomic force microscopy (AFM) has produced a wealth of new opportunities in biosensing. Evolving from an imaging technique to a multifunctional 'lab-on-a-tip', AFM-based force spectroscopy is increasingly used to study the mechanisms of molecular recognition and to probe the chemical groups and dynamics of receptor-ligand interactions in living systems. In the past few years, the general applicability of cantilever nanosensors has been demonstrated for probing DNA hybridization, and detecting medically important biomarkers, such as prostate-specific antigens, cardiac biomarker proteins, DNA binding proteins and mRNA markers for cancer progression. AFM cantilever arrays allow the detection of bioanalytes with picomolar sensitivity, opening new avenues for medical diagnostics and environmental monitoring. Here the author will review the fascinating opportunities offered by the rapid advances in the AFM-biosensing field and the open challenges in AFM-biosensing technology.

Biography

Ahmed Touhami received his PhD in Physics from Pierre & Marie Curie University, France. He spent few years as a research associate at the Catholic University of Louvain (Belgium), Dalhousie University and the University of Guelph (Canada). His research interests are in the fields of Single Molecule Biophysics, Biological Physics, and Nanosciences. He has considerable expertise in single molecule techniques such as AFM, Fluorescence Microscopy, and Optical Tweezers. He has published more than 45 in high impact journals. He was hired at the UTB in 2009 to create an experimental biophysics research and education program at the Physics Department.

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