Institut Ruđer Bošković
ZAVOD ZA TEORIJSKU FIZIKU
Bijenička c. 54
Zagreb, Hrvatska

ZAJEDNIČKI SEMINAR ZAVODA ZA TEORIJSKU FIZIKU I ZAVODA ZA FIZIČKU KEMIJU

Conformationally Adaptive Biosensors

Shlomo Yitzchaik
Institute of Chemistry and the Center for Nanoscience and Nanotechnology,
the Hebrew University of Jerusalem

Datum: četvrtak , 22. veljače 2018.
Vrijeme : **14 sati c.t.**
Mjesto: IRB, predavaona III krila

Abstract:

In this contribution well exemplified the usefulness of label free electrochemical biosensors that utilizes proteins and peptides conformational changes for improved biosensing. Molecular recognition events accompanied with conformational alternation are prone to undergo collective structural change when assembled in monolayers. This phenomenon is demonstrated for ions, small molecules and proteins biosensing. A case study for neurodegenerative disease will be described in depth. Zinc and copper are essential metal ions for numerous biological processes. Their levels are tightly maintained in all body organs. Impairment of the Zn2+ to Cu2+ ratio in serum was found to correlate with many disease states, including immunological and inflammatory disorders. Oxytocin (OT) is a neuropeptide, and its activity is modulated by zinc and copper ion binding. Harnessing the intrinsic properties of OT is one of the attractive ways to develop valuable metal ion sensors. In this talk, we report an OT-based metal ion sensor prepared by immobilizing the neuropeptide onto a glassy carbon electrode. The developed impedimetric biosensor was ultrasensitive to Zn2+ and Cu2+ ions at physiological pH and not to other biologically relevant ions. Interestingly, the electrochemical impedance signal of two hemicircle systems was recorded after the attachment of OT to the surface. These two semicircles suggest two capacitive regions that result from two different domains in the OT monolayer. Moreover, the change in the charge-transfer resistance of either Zn2+ or Cu2+ was not similar in response to binding. This suggests that the metal-dependent conformational changes of OT can be translated to distinct impedimetric data. Selective masking of Zn2+ and Cu2+ was used to allow for the simultaneous determination of zinc to copper ions ratio by the OT sensor. The OT sensor was able to distinguish between healthy control and multiple sclerosis patients diluted sera samples by determining the Zn/Cu ratio similar to the state-of-the-art techniques. The OT sensor presented

herein is likely to have numerous applications in biomedical research and pave the way to other types of neuropeptide-derived sensors.

Voditelj seminara:
Andjelo Samsarov
$\langle asamsarov@irb.hr \rangle$