ELECTROCHEMICAL LIPOSOME-BASED BIOSENSORS FOR NUCLEIC ACID DETECTION

D. Voccia, F. Bettazzi, G. Baydemir, I. Palchetti
Dipartimento di Chimica, Università degli Studi di Firenze, Via della Lastruccia 3 50019 Sesto Fiorentino, Firenze;
e-mail: ilaria.palchetti@unifi.it

Impedance spectroscopy, coupled to disposable gold electrodes and enzyme amplification of the hybridization event, was used for the development of biosensors for the detection of miRNAs. miRNAs are naturally occurring small RNAs, implicated in a number of diseases including a broad range of cancers, heart disease, immunological and neurological diseases. Consequently, miRNAs are intensely studied as candidates for diagnostic and prognostic biomarkers.
In order to increase the sensitivity of the assay, biotin labeled liposomes were employed as nanointerfaces that amplify the primary miRNA-sensing events by their association to the probe-miRNA complex generated onto the transducer. In particular, biotin-labeled liposomes were used as a functional tether for the enzyme Alkaline Phosphatase (AP) and owing to their large surface area, are capable of carrying a large number of enzyme molecules. AP biocatalyze the precipitation of an insoluble product onto the electrode surface, once in presence of BCIP/NBT as substrate. The alteration of the interfacial properties of the electrode surface by the association of the liposomes or upon the precipitation of the insoluble product are followed by Faradaic Impedance Spectroscopy.
Analysis of real samples was also reported.

[1] Bettazzi F., Hamid-Asl E., Esposito C.L., Quintavalle C., Formisano N., Laschi S., Catuogno S., Iaboni M., Marrazza G., Mascini M., Cerchia L., De Franciscis V., Condorelli G., Palchetti I., Analytical and Bioanalytical Chemistry 405, (2013) 1025-34.