

## **Cellular Biosensors: towards a unitary, integrated (nano-bio) analytical platform**

Mihaela Gheorghiu, Cristina Polonschii, Sorin David, Andreea Olaru, Szilveszter Gaspar, Dumitru Bratu & Eugen Gheorghiu

International Centre of Biodynamics (ICB); [www.biodyn.ro](http://www.biodyn.ro); [egheorghiu@biodyn.ro](mailto:egheorghiu@biodyn.ro)

The concept of sensing and detection has to be readdressed in view of the huge number of analytes to be assayed to comply with *Registration, Evaluation, Authorisation* and Restriction of *CHemicals* (REACH) requirements for analysis, labeling and cytotoxicological assessment.

Aiming to advance highly sensitive biosensing systems to detect various analytes (from toxins to pathogen cells, including mixtures thereof) we have developed novel analytical platforms able to reveal subtle variations of biointerfaces encompassed by bioaffinity and hybrid cellular sensors. Such platforms comprise Flow Injection Analysis, allowing for time based combined Electrochemical and Optical assays.

Affinity sensors assess bio-molecular reactions being specific to target analytes. The basic limitation of affinity based sensors relies on their incapacity to detect any other compounds but the targeted ones, having the corresponding affinity partners immobilized on sensor surface.

Cellular biosensors, despite exhibiting a slightly lower sensitivity, do not present such restriction. These sensing platforms are suitable to reveal effects of various (unknown) analytes on different types of cells (grown on nano-patterned or chemically modified surfaces) via specific changes exhibited by cells and/or transducing interfaces. Current aims are cell growth and morphology membrane structure, monolayer integrity, secretion of various compounds (including Reactive Oxygen Species) and cell adhesion to substrate.

The following methods suitable for assessment of kinetics of biointerfaces are integrated and/or deployed to advance the analytical platforms:

- **Electrochemical:** Impedance Spectroscopy and Amperometry
- **Optical:** Surface Plasmon Resonance (SPR), Surface Magnetic Plasmon Resonance (SMPR) and Fluorescence Microscopy (Total Internal Reflection & Epi Fluorescence)
- **Atomic Force Microscopy**

### ICB concept to address cellular platforms

Theoretical aspects dealing with either models of (dynamics) of bio-interfaces (e.g. dielectric behavior of cellular systems, interaction of anti microbial peptides and lipid films), or with analytic related issues (e.g. assessment of reflectivity of multilayers involved in SPR and SMPR assays) as well as Experimental aspects including related ICB research infrastructure, and last but not least, several ICB recent results provided by affinity and hybrid cellular platforms will be outlined.

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