# Development of optical and electrochemical ultra-sensitive sensors for the detection of biomolecular markers for application in clinical and food analysis

Francesco Gagliani, Tiziano Di Giulio, Elisabetta Mazzotta, Cosimino Malitesta

Laboratorio di Chimica Analitica, Dipartimento di Scienze e Tecnologie Biologiche e Ambientali (Di.S.Te.B.A.), Università del Salento, Via Monteroni, 73100 Lecce, Italy

The analytical chemistry field is currently focused on enhancing the already established technologies and creating innovative methods for analyte assessment. Chemical sensors, comprising a recognition element for the target binding and a transducer for the processing of a reliable signal, represent a valid alternative offering fast and specific responses. This led our group to the development of optical and electrochemical sensors based on artificial recognition elements for the detection of analytes of food and clinical relevance. The designed artificial recognition elements were molecularly imprinted polymers (MIPs), deriving from the polymerization of functional monomers around target templates whose removal leaves complementary cavities, and receptors based on metal ion-mediated interaction.

A MIP-based electrochemical sensor was developed for the amperometric detection of tyrosine, obtained from the electropolymerization of a thiophene-derivative around the target molecule. A linear response was achieved in the clinical concentration range 15 – 200 μM with a LOD of 1.04 μM. Selectivity, stability and real sample analysis finalized the analytical performance of the sensor.

An optical sensor based on metal-ion receptor was developed, exploiting the metal ion affinity for analyte functional moieties. Particularly, a reconfiguration strategy was established, allowing the sensor tuning towards different analytes. This resulted in the detection of target analytes such as the dipeptide carnosine and the nucleotide ATP by interchanging between metal ions on the same optical transducer.

Generally, our sensor development strategies led to the production of feasible, cost-effective and sensitive devices, contributing to the increasing demand for innovative instruments involved in clinical and food analysis.

**Acknowledgement**

This research was partly funded by “Programma Operativo Nazionale Ricerca e Innovazione 2014–2020, Fondo Sociale Europeo, Azione I.1 Dottorati Innovativi con caratterizzazione industriale. CUP F85F20000280007”.