Development of electrochemical nitric oxide microsensors for the study of inflammation

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Introduction: During inflammation cells release nitric oxide (NO), a metabolite that can be used as biomarker. Common methods imply the use of sampling and secondary analysis by Griess that assesses the nitrites or by paramagnetic electron resonance (EPR) for direct NO measurement in a solution. However, all these methods cannot provide real time monitoring, limiting the clinical translation. **Aim:** Investigate the feasibility of using an NO electrochemical sensor optimized for biological inflamed fluids. **Material and methods**: Platinum wires were modified or not with poly-o-phenylenediamine (p-OPD) applying +700 mV vs an Ag/AgCl reference electrode. This permselective layer prevents interference by factors such as ascorbic (AA) acid and L-Glutamine (Glu), two major oxidants present in biological fluids. The sensors were calibrated with known SNAP concentrations (0 to 100 µM) using a potential at +865 mV, then tested on ex vivo osteochondral plug under inflammatory condition (1 ng/ml IL1b).

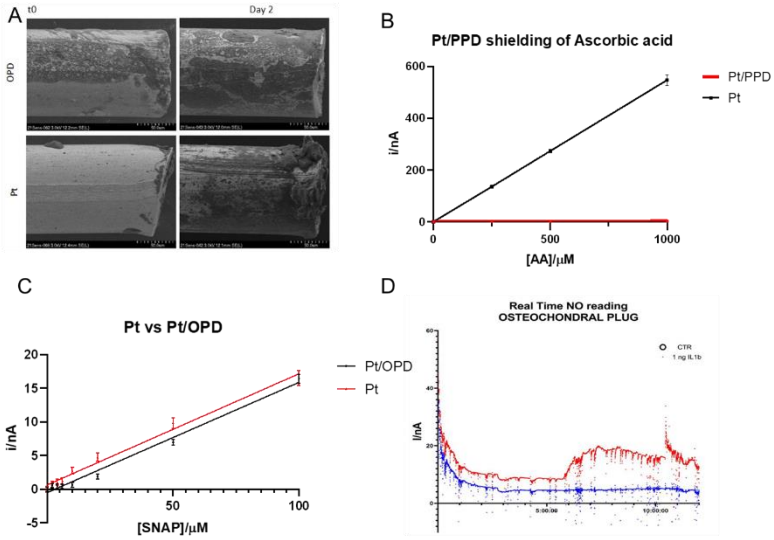

Figure 1 Results overall. A) SEM analysis. B) Shield OPD vs pure Platinum. Calibration curve SNAP. D) Real time monitoring on osteochondral plugs

Results: Sensors modified with p-OPD showed lower background noise for AA and none for Glu, that allowed the real time measurement of NO in cells inflamed for 48 hours. P-OPD increased the performance and the reproducibility and real time monitoring in inflamed biological system (Fig.1).

Discussion and conclusion: The application of NO biological sensors for monitoring *in vitro* and eventually *in vivo* inflammation could help to determine the progression/status of widespread pathologies or infections from pathogens in fluids.