Li et al report a novel single neural probe for real-time simultaneous monitoring of multiple neurochemicals and direct-current electrocorticography (DC-ECoG). A major advance of this probe is the inclusion of two iridium oxide reference electrodes to improve sensor accuracy. The ECoG reference electrode is identical to the ECoG recording electrodes to significantly improve DC stability, while the reference for electrochemical sensors has 10-fold lower polarization rate to minimize the small current-induced drift in the reference electrode potential. In vitro, the single probe selectively measured oxygen (r(2)=0.985±0.01, concentration range=0-60mmHg, limit of detection=0.4±0.07mmHg) and glucose (r(2)=0.989±0.009, concentration range=0-4mM, limit of detection=31±8µM) in a linear fashion. The performance of the single probe was assessed in an in vivo needle prick model to mimic sequelae of traumatic brain injury. It successfully monitored the theoretically expected transient brain oxygen, glucose, and DC potential changes during the passage of spreading depolarization (SD) waves. We envision that the developed probe can be used to decipher the cause-effect relationships between multiple variables of brain pathophysiology with the high temporal and spatial resolutions that it provides [1)].

1)
Li C, Limnuson K, Wu Z, Amin A, Narayan A, Golanov EV, Ahn CH, Hartings JA, Narayan RK. Single probe for real-time simultaneous monitoring of neurochemistry and direct-current electrocorticography. Biosens Bioelectron. 2016 Mar 15;77:62-8. doi: 10.1016/j.bios.2015.09.021. Epub 2015 Sep 11. PubMed PMID: 26386904.