Molecular vital signs: recent advances in in vivo biosensors

The availability of technologies capable of tracking the levels of drugs, metabolites, and biomarkers in real time in the living body would revolutionize our understanding of health and our ability to detect and treat disease. To this end, recent years have seen the development of Electrochemical Aptamer-based (EAB) sensors, an in vivo molecular sensing strategy supporting seconds- to sub-second resolution, real-time drug and biomarker measurements. Comprised of an electrode-bound, redox-reporter-modified aptamer that generates a signal via a binding-induced conformational change, EAB sensors do not rely on the chemical transformation of their targets. Thus, unlike, for example, the continuous glucose monitor, EAB sensors are adaptable to any of a wide range of targets, with more than a dozen drugs and metabolites having been successfully measured in animal models to date. In this talk, I highlight both recent technological advances associated with the EAB platform and a number of advances in pharmacology and physiology enabled by this uniquely high-time-resolution, real-time window into the body's molecular status.