Electrochemical sensor challenge for simultaneous determination of bio-compounds, medicines, and environmental pollutants

Abstract: The quantitative determination of bio-molecules, medicines, environmental pollutants such as dopamine, purine derivatives, DNA bases, ascorbic acid, pain killers medicines, phenolic compounds, and toxic metal ions in real samples such as human blood serum, urine, water, and wastewaters samples play a vital role in helping protect the targeted user population from seizures or deaths due to overdose toxicity. Most of these analytes are co-existing in real samples and must be determined simultaneously. Various bench-top spectroscopy techniques such as chemiluminescence and powerful separation technique such as high-performance liquid chromatography, ultra performance liquid chromatography, capillary electrophoresis methods have been developed for simultaneous determination. More recently, researchers have been leaning toward the development of electrochemical sensors due to the significant advantages associated with these devices such as low-cost and fast response system with the simplicity of operation, the low volume required of expensive reagents and solvents, ease to troubleshoot problems and the possibility to develop a small portable device with high sensitivity and selectivity. Moreover, since the detection of biological and environmental analysis is becoming increasingly essential, research has been focusing on developing sensors that successfully work in real samples. It is critical that these electrochemical sensors successfully work in biological matrices to use them in screening and clinical applications. Most commercial disk electrodes such as glassy carbon, platinum, and gold electrodes do not have good selectivity and sensitivity for simultaneous determination of bio-compounds and need to modify the surface of these electrodes with different methods. Among these disk electrodes, carbon-based electrodes get the most attention due to many advantages such as low cost, low background current, large potential range, and simple surface regeneration procedure. Moreover, it is easy to combine these carbon electrodes with other modifiers since the preparation procedure is very straightforward. Different modification techniques, modifiers (nanocomposites), and the effect of modification in simultaneous determination with high sensitivity, selectivity, speed, and low cost will be explained in this presentation. The researcher's results demonstrated that the modified electrodes are stable, reproducible with a wide dynamic range indicating the future applications of the sensor towards simultaneous determination of the bio-molecules, medicines, and environmental pollutants without using any separation techniques.