Title: Highly sensitive electrochemical detection of ciprofloxacin using MXene (Ti3C2Tx)/poly (rutin) composite as an electrode material

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Abstract: Ciprofloxacin is a widely used antibiotic for treating numerous bacterial infections and it is also considered by the world health organization (WHO) to be extremely vital for human medicine. Therefore, accurate, simple, and cost-effective detection of ciprofloxacin, a commonly used antibiotic, is critical for treating various bacterial infectious diseases. In this work, glassy carbon electrode/poly (rutin)/Ti3C2Tx, is developed for the detection of ciprofloxacin antibiotic. The electrochemical sensor was modified with rutin hydrate monomer and Ti3C2Tx via electro-polymerization of rutin hydrate and drop-casting of Ti3C2Tx. The modified electrode surface was characterized using scanning electron microscopy, high-resolution transmission electron microscopy, attenuated total reflectance- Fourier transform infrared spectroscopy, and electrochemical impedance spectroscopy. The oxidation of ciprofloxacin was performed in 0.01molL−1 of phosphate buffer at a pH level of 5.0. This medium established a linear range of 1.0 × 10−9-1.0 × 10−4 molL−1, limit of detection at 1.0 × 10−9 molL−1 and sensitivity of 0.49 μA/μMcm2. Finally, the modified electrode displayed high selectivity when tested in inorganic-organic mixtures as well as in real sample medium such as blood serum. To the best of our knowledge the current work is the first to report the use of MXene/rutin composite for electrochemical sensing mechanism. The proposed electrochemical sensor has high potential for the formation of therapeutic drug doses application via monitoring of CIP patient intake (clinical settings of CIP).

Keywords: Ciprofloxacin detection, Electrochemical sensor, Glassy carbon electrode, Rutin hydrate, Ti3C2Tx (MXene), Electro-polymerization, Ti3C2Tx drop-casting

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