How chemistry talks with electricity: from proof-of-concept to portable devices fabrication for environmental pandemic problem solving

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Abstract

With the outbreak caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), people's health and environment on a global scale are deeply damaged. Currently, all countries around the world are studying extensively to better understand how the virus attack and which the best pharmaceuticals for COVID-19 treatment is [1]. Consequently, the average concentrations of pharmaceuticals in hospital and domestic effluents are significantly higher than before the pandemic [2], increasing water pollution and adding health risk worldwide (Figure 1). We present a portable device screen-printed carbon-based sensor development as a proof-of-concept. The miniaturized device is useful for a wide range of applications as drug control in pharmaceuticals and environmental or drug monitoring during the degradation process by AOPs as electro-Fenton. The sensor represents the first example of a portable drug-meter device combining the sensitivity of DP Voltammetric technique and the selectivity of screen-printed-carbon-electrode technology for the detection and quantification of micro contaminants in highly complex samples. *In-situ* electrochemical studies reveal the drug-meter's response toward low drug level concentration (LOD-835 ngL-1) with very good precision (RSD-3.7%) and high accuracy (recoveries-98%) with no interferences from common coexisting electroactive species. Correlation of the drug sensor response with that of conventional potentiostat equipment underscores the promise of the portable device sensor to detect drug levels in cheap and fast fashion with very low volume of sample used and without any previous sample treatment. This preliminary investigation indicates that the screen-printed-carbon-based sensor platform holds considerable promise for efficient control and management in different fields. Moreover, aspects related to the analytical performance of the developed device until its fabrication by Metrohm-Dropsens with the corresponding transfer-of-knowledge to society together with prospects for future improvements and applications are discussed.

REFERENCES

[1] Laura Riva *et al.* Nature, 586 (2020) 113
[2] Maria João Fernandes *et al.* Chemosphere, 239 (2020) 124729

FIGURE

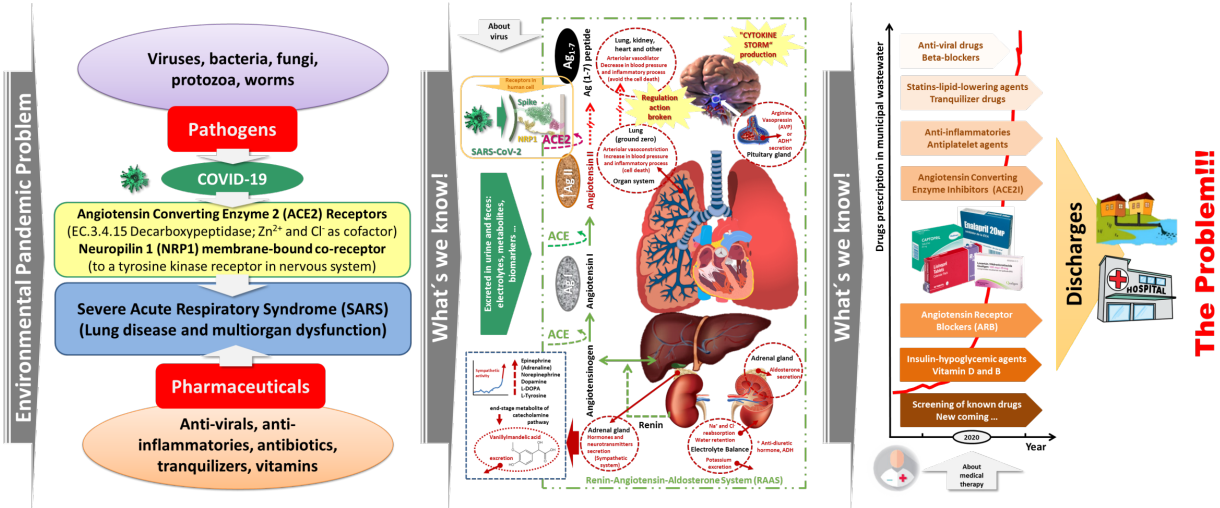

Figure 1: Environmental pandemic problem caused by COVID-19 pharmaceutical medical therapies