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Extended Abstract

Intelligent Multi-Electrode Array for Real-Time Treatment Monitoring of Antipsychotic Clozapine †

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Schizophrenia is a challenging mental health disorder [1]. While various antipsychotics have been used to treat schizophrenia, monitoring schizophrenia treatment requires patients to frequently travel to hospitals in order to test and maintain efficacious levels. Yet, current technologies for antipsychotic drug monitoring require benchtop equipment and long sample preparation times, impeding the ability to rapidly measure various antipsychotics levels at the point-of-care. For example, clozapine is the most effective antipsychotic medication for schizophrenia, but it is dramatically underutilized due to a burdensome monitoring scheme. We propose to overcome the analytical challenges by designing an intelligent multi-sensor array that will be modified with micro/nanometer-thick films [2]. The films are based on 2D materials (reduced graphene oxide, MoS_2 and WS_2) that increase the electrocatalytic activity of the sensors and the underlying variability of the electrochemical signals generated by the antipsychotics. Here, we have shown, (1) the development of microelectrodes modified with 2D materials, (2) the development of an intelligent multi-electrode array framework, and (3) the proof-of-concept extraction of antipsychotic levels from schizophrenia patients by using intelligent chemometric models (Figure 1). By rapidly deciphering the electrochemical signals in whole blood and quantifying the levels of the antipsychotics, better schizophrenia treatment outcome can be enabled.

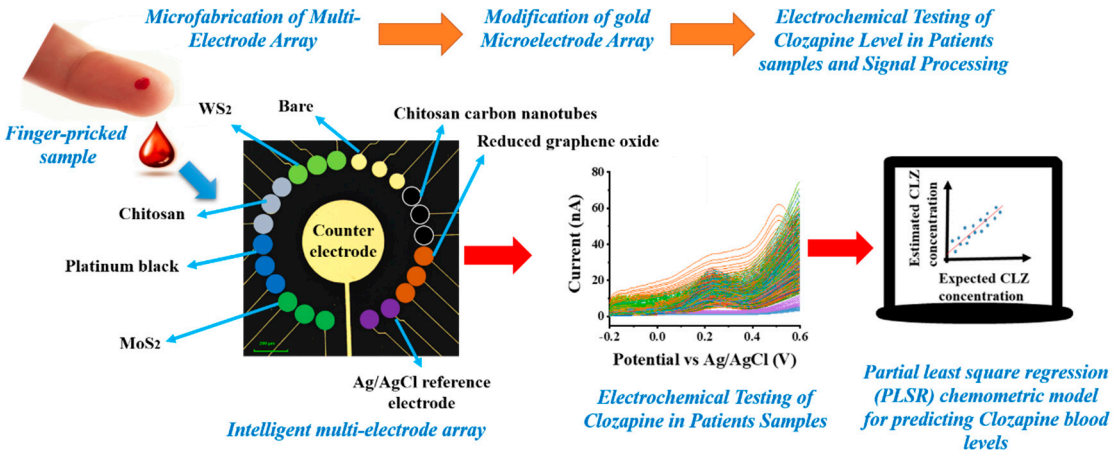

Figure 1. Scheme of the intelligent multi-electrode array system for antipsychotic clozapine detection in finger-pricked microliter volume of whole blood.

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