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Electrochemical approach for acute myocardial infarction diagnosis based on direct antibodies-free analysis of human blood plasma

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ABSTRACT

A novel direct antibodies-free electrochemical approach for acute myocardial infarction (AMI) diagnosis has been developed. For this purpose, a combination of the electrochemical assay of plasma samples with chemometrics was proposed. Screen printed carbon electrodes modified with didodecyldimethylammonium bromide were used for plasma charactrerization by cyclic (CV) and square wave voltammetry and square wave (SWV) voltammetry. It was shown that the cathodic peak in voltammograms at about −250 mV vs. Ag/AgCl can be associated with AMI. In parallel tests, cardiac myoglobin and troponin I, the AMI biomarkers, were determined in each sample by RAMP® immunoassay. The applicability of the electrochemical testing for AMI diagnostics was confirmed by statistical methods: generalized linear model (GLM), linear discriminant analysis (LDA) and quadratic discriminant analysis (QDA), artificial neural net (multi-layer perception, MLP), and support vector machine (SVM), all of which were created to obtain the "True–False" distribution prediction where "True" and "False" are, respectively, positive and negative decision about an illness event.