VOLTAMMETRIC SENSOR FOR DETERMINATION OF PROPRANOLOL IN BIOLOGICAL FLUIDS

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Propranolol is a widely used β-adrenoblokcer, which is prescribed for the treatment of hypertension, cardiac arrhythmia, and prevention of secondary myocardial infarction. Propranolol is used in sports and other stressful situations, acting as a doping agent. Propranolol and its analogues contribute to the development of an antianginal effect, which is manifested by an improvement in the state of the heart muscle, a decrease in the amount of oxygen necessary for its work. This means that the heart requires less oxygen to contract, and the frequency of these reductions also decreases. The drug slows the heart rate in animals, which leads to its use in the race industry. Because of its properties, propranolol is prohibited during the competitive period in certain sports (motor sport, billiard sports, golf, darts, skiing / snowboarding, scuba diving). It is not allowed to use it all the time in the following sports: shooting and archery. It is rapidly metabolized after administration, therefore traces of the drug in biological fluids can be detected with great difficulty some time after the intake. Detection of metabolites and drug residues can provide evidence of the use of doping.

The presence in the propranolol hydroxyl group makes the drug electroactive. Oxidation of propranolol irreversibly proceeds with the transfer of 2 electrons and the formation of a clear peak on the voltammogram in the range of potentials of 800–1400 mV.

In the proposed work, the electrochemical behavior of propranolol contained in urine, on a glassy carbon electrode (SEM) modified with polyarylenephthalide – SO (PAF-SO), was studied. Optimal conditions were chosen for carrying out the electrochemical analysis of propranolol on the SEM modified PAP-SO: the concentration of the propranolol solution was 0.0134 mM, the sweep rate was 0.1 V / s. The effect of the pH of the electrolyte was examined between pH values of 2.00–9.00. The oxidation peak of the compound studied was wider in a neutral medium, which makes the quantitative estimate unreliable. The highest and clearest peak was observed at pH 3.0. Therefore, this pH value was used for further study. The accumulation time is 60 seconds. Linear calibration curves were obtained for concentrations between 4.22×10^{-6} 1.35×10^{-4} mol L^{-1} for propranolol.

A further peak at a potential of 0.65 V is observed in the study of a model urine sample. Additional experiments have shown that this peak is associated with a uric acid oxidation reaction. The proposed method can be used to monitor propranolol in biological fluids.

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