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Abstract

Adrenaline Bi-Enzyme Sensor Using Signal Amplification Principle to Support Adrenal Venous Sampling †

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Primary aldosteronsim (PA) is the most frequent cause of secondary hypertension. Adrenal venous sampling (AVS) is the only reliable way to correctly diagnose PA. However, AVS is a demanding technique due to the positioning of the catheter into the right adrenal vein. The detection of adrenaline during AVS could be, therefore, used as an indicator for the correct position of the catheter, since the adrenaline concentration in adrenal blood (100 nM) is about 100 times higher in comparison to peripheral blood (1 nM). An amperometric bi-enzyme biosensor for the detection of adrenaline based on the substrate recycling principle has been developed. A genetically modified laccase and a glucose dehydrogenase were immobilized on a galvanic oxygen electrode. A low detection limit of 0.5 nM at pH 7.4 (corresponding to the blood pH value) was achieved by performing measurements in phosphate buffer at 30 °C. The cross-sensitivity to other catecholamines (noradrenaline, dobutamine) has been studied. Long-term stability of several days of the bi-enzyme biosensor could be demonstrated. Furthermore, preliminary measurements in real blood samples have been performed. The possibility of an application of the developed bi-enzyme sensor could open new prospects in the field of medical diagnosis.

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