Purification of Tyrosinase From Cultivated Mushrooms for the Development of a Tyrosinase-Based Dopamine Biosensor Utilizing Carbon Quantum Dots

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The study is focused on the development of an innovative biosensor for the quick and cost-efficient measurement of dopamine levels, a critical need in the diagnosis and management of neurological diseases such as Parkinson's, drug addiction and schizophrenia. Traditional methods like High-Performance Liquid Chromatography (HPLC), despite being widely used, are slow and require specialized expertise, making them impractical for rapid measurements. This limitation highlights the urgent necessity for accessible early detection techniques, as timely diagnosis plays a crucial role in the effective treatment of these conditions. Our approach utilizes the enzyme tyrosinase, extracted from cultivated mushrooms, to catalyze the oxidation of dopamine, in conjunction with carbon quantum dots (CQDs) to improve the biosensor's conductivity and sensitivity. The choice of tyrosinase is based on its ability to specifically target dopamine, while CQDs are selected for their excellent conductivity, large surface area, and eco-friendliness. This study proposes a novel, environmentally sustainable method to significantly reduce both the time and cost associated with measuring dopamine levels, potentially revolutionizing the diagnostic process for a range of conditions linked to dopamine imbalance. The study also incorporates graphic reading software compatible with the Vernier cyclic voltammetry program. Data captured by a voltmeter was analyzed using a Python-based code, facilitating rapid result computation by inserting the variable into a specially formulated equation for dopamine measurement. The software development was utilized with libraries such as sys, subprocess, numpy, cv2, pathlib, tkinter, and PIL, showcasing the integration of programming to enhance diagnostic efficiency.