ADVANCING GGT RESEARCH WITH SECM AND NOVEL ELECTROCHEMICAL PROBES

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y-Glutamyl transpeptidase (GGT) is a crucial enzyme involved in the metabolism of glutathione (GSH) [1]. This enzyme is mostly found in the cellular membranes of many organs, with the highest concentrations observed in the liver, kidney, and pancreas. Increased levels of GGT have been found to be associated with various types of human tumors, including liver, cervical, ovarian, and breast cancers [2]. Elevated levels of GGT in the bloodstream can be utilized as a diagnostic indicator for assessing the functionality of the liver, bile ducts, the presence of pancreatitis, and cholestasis [3]. In addition, GGT is used as a biochemical marker for alcohol use because there is a direct relationship between the amount of alcohol consumed and the activity of GGT [4].

In clinical practice, GGT measurements are usually performed during liver function tests. GGT demonstrates potential as a therapeutic target for various disorders, in addition to its diagnostic usefulness. For instance, suppressing GGT activity in animal models of nonalcoholic fatty liver disease can enhance insulin sensitivity and decrease the accumulation of fat in the liver [3]. Therefore, it is imperative to assess GGT activity in the body and biological fluids for the immediate identification of diverse illnesses and the monitoring of therapy. Colorimetric measurement, electrochemical and luminescence analysis are some of the ways that the amount of GGT present can be found. Among these technologies, bioassays utilizing responsive probes have garnered significant interest. As a result, a number of responsive probes have been created in recent years to quantify GGT activity.

The signal intensity of an enzyme in an electrochemical system can be affected by whether the enzyme is immobilized on a surface or in a liquid state. The process of immobilizing on a surface is frequently utilized in bioelectrochemical devices, such as biosensors, to improve stability, expand the surface area, and enable electron transport. Enzymes can be immobilized on a surface to create a stable and regulated environment. It facilitates the effective flow of electrons to electrodes, hence improving the overall strength of the signal. The aim of our studies is to perform research on the enzyme GGT using scanning electrochemical microscopy (SECM) and a recently developed electrochemical probe [3].

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