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Possibilities for Biosensors and Bioelectronics in Medical Assessment

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Editorial

Cholesterol is produced by the liver and is a necessary component of a balanced fat diet. Cholesterol and triglycerides are key components of cell structure and are utilised in the production of hormones, vitamin D, and energy. High total cholesterol levels, especially those of the low-density lipoprotein type, can damage blood vessels and lead to disorders including coronary heart disease and peripheral vascular disease [1].

Nephrosis, diabetes milletus, myxedema, and jaundice have all been associated to high cholesterol. Low cholesterol, on the other hand, can cause hyperthyroidism, anaemia, and maladsorption. Recent research has discovered that excessive cholesterol can damage macrophages, which are part of the innate immune system and are responsible for eating infections and removing dead cells [2]. An individual's target total plasma cholesterol level is less than 5.2 mM, with a high level defined as higher than 6.2 mm As a result, industrial and clinical cholesterol determination is of tremendous importance. Electrochemical biosensors provide a number of benefits.

These devices are especially prepared to satisfy the compact size, cost efficiency, low volume, and power criteria of dispersed testing, and they have a lot of potential in a variety of biological and environmental applications [3]. Because of the metalloenzyme's deeply implanted redox-active core, facilitating electron transport between the enzyme and the electrode is a major difficulty in the creation of electrochemical biosensors.

On the one hand, for the creation of enzyme-based biosensors, tremendous efforts have been made to improve electron transfer in sensor design by adding mediators, promoters, or other specific materials such as peroxidases. Due to the nanoparticles' high surface roughness as well as their unique physical, electrical, and chemical capabilities, increased sensitivity and close attachment of enzymes may be achieved using nanomaterials. The use of nanostructured materials in the creation of high-performance electrochemical biosensors has gotten a lot of interest.

Due to their ease of synthesis and functionalization, great chemical stability, low intrinsic toxicity, and adjustable optical and electrical characteristics, gold nanoparticles have piqued attention. The features of Au nanoparticles stated above have been shown to efficiently enable electron transport in the creation of an electrochemical biosensor [4]. Few biosensors for cholesterol determination have been published compared to those for glucose determination; consequently, developing biosensors based on gold nanostructures for total cholesterol detection might have a substantial influence on both clinical diagnostics and the food business.

Aravamudhan et al. used direct physical adsorption to bind enzymes to the surface of aligned gold nanowires in order to create an electrochemical cholesterol biosensor. The manufactured biosensor has a sensitivity of 0.85 A mM1 and a Michaelis–Menten constant of 17.1 mM, according to their research. Recently reported on the construction of a biosensor for the detection of free cholesterol by combining the favourable properties of MWNT, Au nanoparticles, chitosan, and ionic liquid to increase the sensitivity. The deacetylated result of chitin, poly, is chitosan, a polysaccharide comprised mostly of -(1,4)-linked 2-deoxy-2-amino-d-glucopyranose units.

Because of its biocompatibility, biodegradability, numerous functional groups, and solubility in acidic aqueous solution, chitosan has been employed to make biosensing devices. The industrial and clinical determination of cholesterol is becoming increasingly significant due to the large medicinal ramifications. Because 70% of cholesterol in a blood sample is in ester form and 30% is in free form, total cholesterol detection is desired. For the first time, we used chitosan to co-immobilize three enzymes, cholesterol oxidase, cholesterol esterase, and horseradish peroxidase, on nanoporous Au networks for the detection of total cholesterol. The hydrothermal technique was used to generate the nanoporousAunetworks directly on a titanium substrate [5].

There were no additional promoters or special elements in the biosensor that were harmful to the environment or humans. The constructed cholesterol biosensor exhibits a high sensitivity, a very low Michaelis–Menten constant, a wide linear range, a low detection limit, strong selectivity, and outstanding stability, according to our electrochemical experiments [3]. The cholesterol biosensor created in this work was also tested on genuine food samples, demonstrating that it has potential uses in clinical diagnostics as well as the food business.

Conflict of Interest

None.

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