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Modifikasi Elektroda Glassy Carbon dengan Nanopartikel Emas Termodifikasi Beta-Siklokdekstrin dan Aplikasinya sebagai Sensor Elektrokimia Kolesterol = Modification of Glassy Carbon Electrode with Bheta-Cyclodextrin Modified Gold Nanoparticles and Its Application as Electrochemical Cholesterol Sensor

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Abstrak

Kolesterol merupakan komponen struktural membran sel dan berfungsi sebagai induk untuk sintesis berbagai hormon steroid, vitamin D, dan asam empedu. Kadar kolesterol rendah dikaitkan dengan dengan malnutrisi dan kadar lipoprotein rendah. Sementara kadar kolesterol tinggi dikaitkan dengan penyakit jantung coroner dan hipertensi. Maka dari itu, deteksi kolesterol sangat penting sehingga diagnosis kondisi kardiovaskular dan neurologis dapat dideteksi sedini mungkin. Sensor elektrokimia enzimatik mendapat banyak perhatian, akan tetapi memiliki kekurangan seperti mudah terdenaturasi. Pada penelitian ini dikembangkan sensor non-enzimatik kolesterol berdasarkan kompetisi pembentukan kompleks inklusi antara -siklodektrin dan kolesterol serta -siklodekstrin dan nanopartikel emas. Nanopartikel emas disintesis secara elektrodeposisi dengan Teknik CV pada rentang potensial 0,044 – 0,944 V vs. Ag/AgCl dengan siklus yang dioptimasi. -CD diimobilisasi pada permukaan berbahan material nano dengan elektropolimerisasi. Peningkatan sinyal redoks proporsional dengan penambahan kolesterol. Sensor menghasilkan LoD 23 M dan LoQ 76 M dengan rentang linear sebesar 0-200 M. Selain itu sensor menunjukkan selektivitas yang baik terhadap kehadiran interferensi dengan arus yang tidak berubah signifikan (99%-95%) dan repeatabilitas dengan RSD kurang dari 5%.

.....Cholesterol is a structural component of cell membranes and functions as a parent for the synthesis of various steroid hormones, vitamin D and bile acids. Low cholesterol levels are associated with malnutrition and low lipoprotein levels. Meanwhile, high cholesterol levels are associated with coronary heart disease and hypertension. Therefore, cholesterol detection is very important so that the diagnosis of cardiovascular and neurological conditions can be detected as early as possible. Enzymatic electrochemical sensors have received a lot of attention, but they have disadvantages such as being easily denatured. In this research, a non-enzymatic cholesterol sensor was developed based on competition for the formation of inclusion complexes between -cyclodextrin and cholesterol as well as -cyclodextrin and gold nanoparticles. Gold nanoparticles were synthesized by electrodeposition using the CV technique in the potential range of 0.044 – 0.944 V vs. Ag/AgCl with optimized cycles. -CD was immobilized on a nanomaterial surface by electropolymerization. The increase in redox signals is proportional to the addition of cholesterol. The sensor produces a LoD of 23 M and a LoQ of 76 M with a linear range of 0-200 M. In addition, the sensor shows good selectivity against the presence of interference with a current that does not change significantly (99%-95%) and repeatability with % RSD lower than 5%.