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A novel sensitive amperometric choline biosensor based on multiwalled carbon nanotubes and gold nanoparticles

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Abstract

A novel amperometric biosensor for choline determination has been developed, exploiting the electrocatalytic properties of multiwalled carbon nanotubes (MWCNT) and gold nanoparticles (GNP). Chitosan (Chit), a natural biocompatible polymer, was used to disperse CNT, then Chit-MWCNT was dropped on the surface of a glassy carbon electrode (GCE), followed by GNP; finally, choline oxidase (ChOx) was immobilized by glutaraldehyde crosslinking. The ChOx/(GNP)₄/MWCNT/GCE exhibited linear response to choline from 3 to 120 μM , the sensitivity was $204 \mu\text{A cm}^{-2} \text{mM}^{-1}$ and the detection limit was 0.6 μM . The biosensor exhibited good intra and inter-electrode precision, and excellent selectivity and stability. Electrochemical impedance spectroscopy (EIS) was also used to measure choline at 0.0 V and this is the first report on choline determination by EIS. Successful measurement in milk samples was performed.

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