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www.elsevier.com/locate/talanta

PII: S0039-9140(17)30262-X
DOI: http://dx.doi.org/10.1016/j.talanta.2017.02.048
Reference: TAL17324

To appear in: *Talanta*

Received date: 29 December 2016
Revised date: 17 February 2017
Accepted date: 19 February 2017

Cite this article as: Hend Samy Magar, Mariana Emilia Ghica, Mohammed Nooredeen Abbas and Christopher M.A. Brett, A novel sensitive amperometric choline biosensor based on multiwalled carbon nanotubes and gold nanoparticles *Talanta,* http://dx.doi.org/10.1016/j.talanta.2017.02.048

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 μA cm^{-2} 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.

Graphical abstract