

Author's Accepted Manuscript

Optimization of gold nanoparticle-based real-time colorimetric assay of dipeptidyl peptidase IV activity

Hasan Saad Aldewachi, Nicola Woodroffe, Simon Turega, Philip H E Gardiner



www.elsevier.com/locate/talanta

PII: S0039-9140(17)30335-1
DOI: <http://dx.doi.org/10.1016/j.talanta.2017.03.039>
Reference: TAL17384

To appear in: *Talanta*

Received date: 8 February 2017
Revised date: 11 March 2017
Accepted date: 15 March 2017

Cite this article as: Hasan Saad Aldewachi, Nicola Woodroffe, Simon Turega and Philip H E Gardiner, Optimization of gold nanoparticle-based real-time colorimetric assay of dipeptidyl peptidase IV activity, *Talanta*, <http://dx.doi.org/10.1016/j.talanta.2017.03.039>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and a review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Optimization of gold nanoparticle-based real-time colorimetric assay of dipeptidyl peptidase IV activity

Hasan Saad Aldewachi^{1,2}, Nicola Woodroffe¹, Simon Turega¹, Philip H E Gardiner^{1*}

¹Biomolecular Research Centre, Sheffield Hallam University, City Campus, Sheffield, S1 1WB, UK

²Pharmacy College, Mosul University, Mosul, Iraq

*Corresponding author: p.h.gardiner@shu.ac.uk; ORCID: 0000-0002-2687-0106

Abstract

Dipeptidyl peptidase IV (DPP-IV also referred to as CD-26) is a serine protease enzyme with remarkable diagnostic and prognostic value in a variety of health and disease conditions. Herein, we describe a simple and real-time colorimetric assay for DPP-IV/CD-26 activity based on the aggregation of gold nanoparticles (AuNPs) functionalized with the peptide substrates: Gly-Pro-Asp-Cys (GPDC) or Val-Pro-ethylene diamine-Asp-Cys (VP-ED-DC). Cleavage of the substrates by DPP-IV resulted in aggregation of the AuNPs with accompanying colour change in the solution from red to blue that was monitored using either a UV-visible spectrophotometer or by the naked eye. Factors, such as pH, ionic strength and the structure of the substrate that influence the cleavage reaction in solution were investigated. The effects of potential interference from serum proteins (lysozyme, thrombin and trypsin) on the analytical response were negligible. The detection limits when GPDC or VP-EN-DC functionalized AuNPs were used for DPP-IV assay were 1.2 U/L and 1.5 U/L, respectively. The VP-EN-DC method was preferred for the quantitative determination of DPP-IV activity in serum because of its wide linear range 0 - 30 U/L compared to 0-12 U/L for the GPDC assay. Recoveries from serum samples spiked with DPP-IV activity, between 5-25U/L, and using the VP-EN-DC modified AuNPs method ranged between 83.6-114.9%. The two colorimetric biosensors described here are superior to other conventional methods because of their simplicity, stability, selectivity and reliability.

Keywords

gold nanoparticles, colorimetric assay, peptide substrates and DPP-IV enzyme activity.

Download English Version:

<https://daneshyari.com/en/article/5140934>

Download Persian Version:

<https://daneshyari.com/article/5140934>

[Daneshyari.com](https://daneshyari.com)