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The conventional method of assessing acetylcholinesterase (AChE) activity is usually performed by using *in-vitro* colorimetric enzymatic assay in the presence of thiocholine, AChE and dithiobisnitrobenzoic acid (DTNB). The concentrations of end products of DTNB are measured and visible under UV spectrophotometer at a specific range of 405-420 nm. Natural products acting as AChE inhibitors in which absorb similar UV range may affect the absorbance readings of the end products in the assay. This paper demonstrated the protective effect of thiol-containing compounds (thiocholine and glutathione) against enzymatic etching of gold nanorods (AuNRs) (shortening of AuNRs length). This application enables a construction of an alternative way to assess the AChE activity by using AuNRs as a probe instead of DTNB. Hydrolysis activity of acetylthiocholine by AChE produces thiocholine that can protect AuNRs from etching. Therefore in this journal club meeting, the application is discussed here in order to further understand the use of AuNRs for AChE enzymatic activity, in comparison with the conventional method, and to look at the advantages of using AuNRs in the detection of AChE activity.

Blocked Enzymatic Etching of Gold Nanorods: Application to Colorimetric Detection of Acetylcholinesterase Activity and Its Inhibitors

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Abstract

The anisotropic morphology of gold nanorods (AuNRs) has been shown to lead to nonuniform ligand distribution and preferential etching through their tips. We have recently demonstrated that this effect can be achieved by biocatalytic oxidation with hydrogen peroxide, catalyzed by the enzyme horseradish peroxidase (HRP). We report here that modification of AuNRs with thiol-containing organic molecules such as glutathione and thiocholine hinders enzymatic AuNR etching. Higher concentrations of thiol-containing molecules in the reaction mixture gradually decrease the rate of enzymatic etching, which can be monitored by UV–vis spectroscopy through changes in the AuNR longitudinal plasmon band. This effect can be applied to develop novel optical assays for acetylcholinesterase (AChE) activity. The biocatalytic hydrolysis of acetylthiocholine by AChE yields thiocholine, which prevents enzymatic AuNR etching in the presence of HRP. Additionally, the same bioassay can be used for the detection of nanomolar concentrations of AChE inhibitors such as paraoxon and galanthamine.