Quantitative visualized detection of acetylcholinesterase activity and its inhibitor based on oxidization character of ultrathin MnO$_2$ nanosheets

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Table S1 The structure of the compounds 1-13.

Fig.S1. Optimization condition of substrate concentration for AChE-MnO$_2$-OPD biosystem.

Fig.S2. Effects of (A) concentrations of MnO$_2$ nanosheets and (B) concentrations of OPD on the absorption intensity. Optimization conditions of the reaction time (C) and (D) reaction temperature for MnO$_2$-OPD platform.

Fig.S3. (A) Optimization reaction condition for substrate (B) Optimization reaction time for Ellman method.

Fig.S4. The EDS spectrum of MnO$_2$ nanosheets.

Fig.S5. (A) Cell viability of the four compounds at 80 µM in a cytotoxicity assay.
<table>
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<th>Number</th>
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<th>Molecular formular</th>
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HJ-38

\[ \text{C}_6\text{H}_{10}\text{O}_3 \quad 154 \]

HJ-35

\[ \text{C}_{25}\text{H}_{36}\text{O}_{13} \quad 580 \]

HJ-40

\[ \text{C}_{22}\text{H}_{28}\text{O}_8 \quad 420 \]

HJ-45

\[ \text{C}_{13}\text{H}_{12}\text{O}_8 \quad 330 \]
The absorption intensity changed under different concentrations of ATCh (0, 0.05, 0.1, 0.2, 0.5, 1.0 mM final solution).
As shown in Fig. S2A, with the increasing concentration of MnO₂ in OPD solution the absorption intensity increased. Same results showed various concentration of OPD added into MnO₂ solution (Fig. S2B). The optimization concentrations of MnO₂ and OPD for MnO₂-OPD system were 5 µM and 20 mM. The optimization reaction condition for time and temperature is 20 min and 80 °C (Fig. S 2C - 2D).
Fig. S3.

The absorption intensity under different concentrations of (A) ATCh (0, 0.05, 0.1, 0.2, 0.25, 0.3, 0.4, 1.0 mM final solution) and (B) Optimization reaction time with ATCh (0.5 mM) and AChE (10 U/L) incubated for 0, 5, 10, 20, 30 min, respectively.
Fig. S5.

![Graph showing cell viability (%) for different compounds. The x-axis represents the compounds (Control, HJ-38, HJ-35, HJ-40, HJ-45) and the y-axis represents cell viability (%). The graph indicates that all compounds have a cell viability percentage close to 100%, with no significant differences between them.](image-url)
**Data analysis:** IE was analyzed by the following equation: 

$$\text{IE} = \frac{(F_{\text{inhibitor}} - F_{\text{no-inhibitor}})}{(F_0 - F_{\text{no-inhibitor}})}$$

where $F_{\text{inhibitor}}$ and $F_{\text{no-inhibitor}}$ represent the absorbance intensity of AChE-MnO$_2$-OPD system and AChE-MnO$_2$-OPD-inhibitor system, respectively. $F_0$ refers to the absorbance intensity of the MnO$_2$-OPD system without AChE and inhibitor [1].
. Reference