

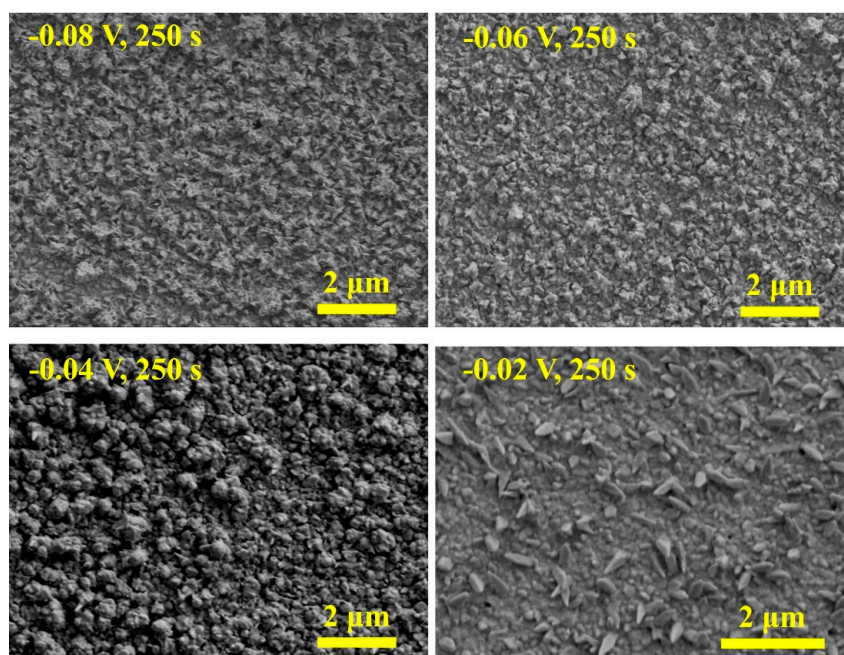
# Rapid Evaluation of Antibacterial Carbohydrates on a Microfluidic Chip Integrated with the Impedimetric Neoglycoprotein Biosensor

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## SI-1. Bacterial Culture

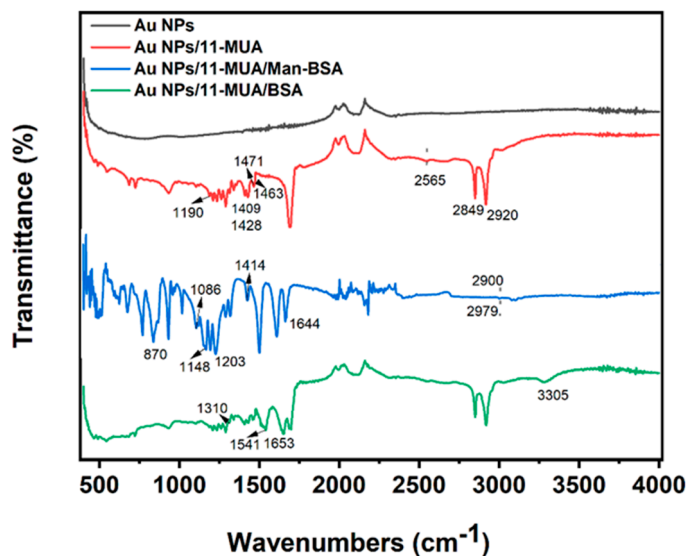
*S. typhimurium* ATCC14028 was provided by Professor Yi (Chongqing Medical University). It was cultured in lactose broth at 37 °C for 16 h. The cultured bacteria (1 mL) were collected via centrifugation at 6000 rpm for 5 min. The supernatant was discarded, and the bacteria left at the bottom were dispersed in 1 mL filtered PBS. The centrifugation and washing steps were repeated twice. The cultured cell sample was diluted with filtered PBS to the desired concentrations before use. The number of live cells was determined through colony counting on an agar plate.

## SI-2. SEM images of prepared Au NPs on the microelectrode under different voltages



**Figure S1.** SEM images of Au NPs prepared on the microelectrode under voltages of -0.08 V, -0.06 V, -0.04 V, and -0.02 V, with a time of 250 s.

## SI-3. Characterization of nanosensing surface (Man-BSA/AuNPs) using ATR-FTIR



**Figure S2.** ATR-FTIR spectra of the Au NPs, Au NPs/11-MUA, Au NPs/11-MUA/Man-BSA, and Au NPs/11-MUA/BSA.

**ATR-FTIR of Au NPs/11MUA:** The 2920  $\text{cm}^{-1}$  peak was assigned to the asymmetric  $\text{CH}_2$  stretching. The 2849  $\text{cm}^{-1}$  peak was assigned to symmetric  $\text{CH}_2$  stretching. The 2565  $\text{cm}^{-1}$  peak was assigned to the S-H stretching. The 1409  $\text{cm}^{-1}$ , 1428  $\text{cm}^{-1}$ , 1463  $\text{cm}^{-1}$ , and 1471  $\text{cm}^{-1}$  peaks were assigned to the  $\text{CH}_2$  scissoring. The 1190  $\text{cm}^{-1}$  peak was assigned to symmetric  $\text{CH}_2$  stretching [1]

**ATR-FTIR of Au NPs/11MUA/BSA:** The 1653  $\text{cm}^{-1}$  peak was assigned to the amide I band, as expected for a protein with a high proportion of  $\alpha$ -helix. The 1541  $\text{cm}^{-1}$  peak was assigned to the amide II band [2]. The 1310  $\text{cm}^{-1}$  can be assigned to the amide III band [3]

**ATR-FTIR of Au NPs/11MUA/Man-BSA:** The 2979  $\text{cm}^{-1}$  and 2900  $\text{cm}^{-1}$  peaks were assigned to mannose C-H stretching vibrations; 1414  $\text{cm}^{-1}$  was assigned to mannose C-H angular vibrations; 1644  $\text{cm}^{-1}$  was assigned to the stretching vibration of amide bond  $\text{C}=\text{O}$ ; 1086  $\text{cm}^{-1}$ , 1148  $\text{cm}^{-1}$ , and 1203  $\text{cm}^{-1}$  were assigned to C-O and C-O-C stretching vibrations on the mannose ring; 870  $\text{cm}^{-1}$  was attributed to carbon-nitrogen bond (C-N), which was the characteristic bond in glycoprotein conjugate[4] .

## References

1. Elzein T, Fahs A, Brogly M, et al. Adsorption of alkanethiols on gold surfaces: PM-IRRAS study of the influence of terminal functionality on alkyl chain orientation. *J. Adhesion* **2013**, 89, 416–432. <http://dx.doi.org/10.1080/00218464.2013.757521>.
2. Retnakumari A, Setua S, Menon D, et al. Molecular-receptor-specific, non-toxic, near-infrared-emitting Au cluster-protein nanoconjugates for targeted cancer imaging. *Nanotechnology*, **2009**, 21, 055103.
3. Xu Y, Sherwood J, Qin Y, et al. The role of protein characteristics in the formation and fluorescence of Au nanoclusters. *Nanoscale*, 2014, 6, 1515–1524. DOI: 10.1039/c3nr06040c).
4. Wang H, Cheng X, Shi Y, et al. Preparation and structural characterization of poly-mannose synthesized by phosphoric acid catalyzation under microwave irradiation. *Carbohydr.Polym.* **2015**, 121, 355–361. <http://dx.doi.org/10.1016/j.carbpol.2014.12.046>.