Supplementary Information

Separation and Detection of Mutans Streptococci by Magnetic Nanoparticles Stabilized with Enzyme-conjugated Polymer

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**Fig. S1** Schematic plasmid map including CWBD (top) and the expressed CWBD protein on SDS-PAGE (bottom).
Fig. S2 XRD pattern of bare MNPs prepared by a solvothermal method.
**Fig. S3** FT-IR spectra of MNPs: (a) unmodified, (b) grafted with PAA and (c) conjugated with CWBD.
<table>
<thead>
<tr>
<th>Sample</th>
<th>Hydrodynamic size (nm)</th>
<th>PDI</th>
<th>Zeta potential (mV)</th>
</tr>
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<tbody>
<tr>
<td>Bare MNPs</td>
<td>318 ± 18</td>
<td>0.30</td>
<td>-18.00</td>
</tr>
<tr>
<td>PAA-grafted MNPs</td>
<td>460 ± 21</td>
<td>0.37</td>
<td>-31.43</td>
</tr>
<tr>
<td>CWBD-conjugated MNPs</td>
<td>627 ± 20</td>
<td>0.31</td>
<td>-14.40</td>
</tr>
</tbody>
</table>
Fig. S4 TGA (under N$_2$) curves of (a) unmodified MNPs, (b) PAA-grafted MNPs, and (c) CWBD-conjugated MNPs analyzed with a heating rate of 20°C /min.
Determination of Limit of Detection and Capture Efficiency

\( I_{LOD} \) represents the intensity at LOD which is calculated from the equation below whereas \( I_0 \) reflects the intensity of the background and \( SD_0 \) is standard deviation of the background.

\[
I_{LOD} = 3SD_0 + I_0
\]  
\text{(eq.S1)}

After that, LOD was calculated from \( I_{LOD} \) using linear equation of the calibration curve as shown below, where \( m \) and \( c \) are slope and intercept of the calibration curve, respectively.

\[
I = m \log(CFU) + c
\]  
\text{(eq.S2)}

By substitute \( I_{LOD} \) and LOD into the equation, it can then be rearranged as shown below:

\[
LOD = 10^{(I_{LOD} - c)/m}
\]  
\text{(eq.S3)}

\( C_{\text{before}} \) represents the number of colonies formed on the agar plate by diluted bacteria stock in PBS whereas \( C_{\text{after}} \) reflects the number of the unbound bacteria after contacting with the CWBD-conjugated MNPs

\[
\text{Capture efficiency (\%) } = \left\{ \frac{C_{\text{before}} - C_{\text{after}}}{C_{\text{before}}} \right\} \times 100
\]  
\text{(eq.S4)}
**Fig. S5** Photographs of tested oral streptococci colonies on BHI agar plate before and after binding to CWBD-conjugated MNPs. The numbers represent the number of colony in CFU/mL.