Supplementary Information

A novel fluorescence method for the rapid detection of *Listeria monocytogenes* using aptamer-conjugated magnetic nanoparticles and aggregation-induced emission dots

Yuanyuan Guo, a, # Chao Zhao, a, # Yushen Liu, a Heran Nie, b, * Xiaoxiao Guo, a Xiuling Song, a Kun Xu, a Juan Li, a and Juan Wang, a, *

a School of Public Health, Jilin University, Changchun, Jilin, 130021, PR China

b Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, Liaoning, 116023, PR China

# These authors contributed equally to this work.

* Corresponding Author: li_juan@jlu.edu.cn; jwang0723@jlu.edu.cn
1. SDS-PAGE result of rabbit IgG antibody of *L. monocytogenes*

![SDS-PAGE result of rabbit IgG antibody of *L. monocytogenes*. Protein marker (lane M); rabbit IgG antibody of *L. monocytogenes* (lane 1).](image)

2. Synthesis and characterization of apt-MNP

The MNPs were prepared through a solvothermal method according to our previous paper ¹, and apt-MNP was fabricated according to our previous literature ². In Fig. S2A, the TEM image shows apt-MNPs were well dispersed roughly spherical nanoparticles. And Fig. S2B shows the apt-MNPs captured *L. monocytogenes* closely. The FTIR spectrum of Fe₃O₄ MNPs (black curve) and apt-MNP (red curve) are demonstrated in Fig. S2C. The obvious characteristic band of Fe₃O₄ MNPs at 582 cm⁻¹ and 3431 cm⁻¹ can be attributed to the stretching vibration of Fe-O and O-H vibrations ³⁻⁵. In comparison with Fe₃O₄ NPs, several new characteristic peaks were observed from the spectrum of apt-MNPs. Especially, the band at 1521 cm⁻¹, 1629 cm⁻¹, 2800 cm⁻¹ and 2879 cm⁻¹, which are assigned to C=O bond, C=C bond, CH₂ groups, respectively ⁶. Owing to the negative charge of the phosphate moieties of aptamer, the zeta potential of apt-MNP is sharply decreased from -68.45 to -90.87 mV (Fig. S2D). All these results confirm that the apt-MNP was expected to be synthesized as the aptamer of *L. monocytogenes* binds to MNP successfully.
3. The loading efficiency of TPE-OH@BSA NPs

The loading efficiency was measured by conducting three replicate analyses through a fluorescence spectrophotometer. The loading efficiency is expressed by ΔF/F₀ (ΔF = F₀ - F, where F₀ is the original fluorescence intensity of TPE-OH in THF/H₂O₂, and F is the fluorescence intensity of TPE-OH in the supernatant after encapsulated).

Table S1 The loading efficiency of TPE-OH@BSA NPs

<table>
<thead>
<tr>
<th>Sample</th>
<th>F₀</th>
<th>F</th>
<th>Loading efficiency (%)</th>
<th>RSD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4866.12</td>
<td>554.25</td>
<td>88.61</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4860.85</td>
<td>635.80</td>
<td>86.92</td>
<td>1.29</td>
</tr>
<tr>
<td>3</td>
<td>4872.63</td>
<td>513.09</td>
<td>89.47</td>
<td></td>
</tr>
</tbody>
</table>

4. Optimization of the incubation time
To obtain the best incubation time, the fluorescence intensity of the reaction system with *L. monocytogenes* concentrations of $10^6 \text{cfu·mL}^{-1}$ was measured at 30, 45, 60, 90 and 120 min, respectively. Then use an external magnetic field to separate immune complex. Subsequently, the fluorescence intensity of the supernatant at 464 nm was measured. The difference of fluorescence intensity between negative and positive was calculated under different incubation time. As shown in Fig. S3, with the extension of reaction time, the difference between negative and positive gradually increased, and reached the maximum fluorescence intensity at 90 min, and then gradually decreased. Therefore, 90 min was selected as the best reaction incubation time.

![Fluorescence Intensity](image)

Fig. S3 Optimization of incubation time (30, 45, 60, 90, 120 min).

5. Detection of real samples

The calibration plot for *L. monocytogenes* in water from Nan Lake, Yan Lake and pork meat.
Fig. S4 (A) The calibration curve for \textit{L. monocytogenes} in Nan Lake samples. (B) The calibration curve for \textit{L. monocytogenes} in Yan Lake samples. (C) The calibration curve for \textit{L. monocytogenes} in pork meat samples. (Fluorescence intensity vs the logarithm of \textit{L. monocytogenes} concentration). Error bars represent the standard deviation of three replicates.

References


