Electronic Supplementary Material (ESI) for Analyst.
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Supporting Information for

Tryptamine-functionalized magnetic nanoparticles for highly sensitive detection of *Salmonella* Typhimurium

Table S1. Specific sequence and primers we used to identify DNA of *S.* Typhimurium.

Target	Sequences (5'-3')	T_m(°C)	Product size (bp)
S. Typhimurium-*Forward*	5'-TATCGCCACGTTCGGGCAA-3'	59.7	275
S. Typhimurium-*Reverse*	5'-TCGCACCGTCAAAGGAACC-3'	58.1	

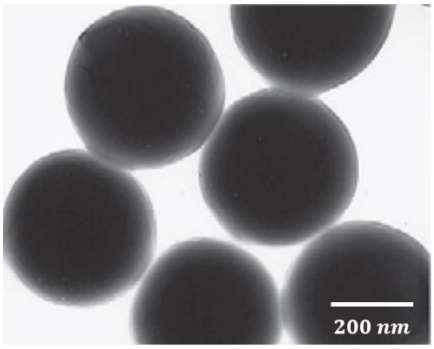


Figure S1. A TEM image of Indole@MNPs

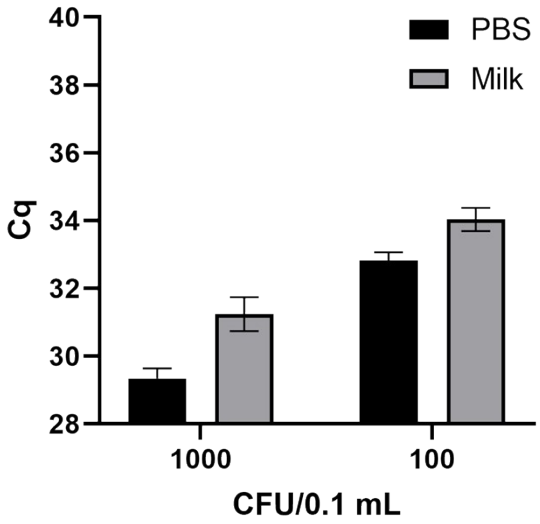


Figure S2. Evaluation of interference of milk during sample preparation using commercial kit. No Cq values were obtained after amplification of no-template controls (NTCs) in any experiments. Error bars indicate standard deviation from mean based on three independent experiments.

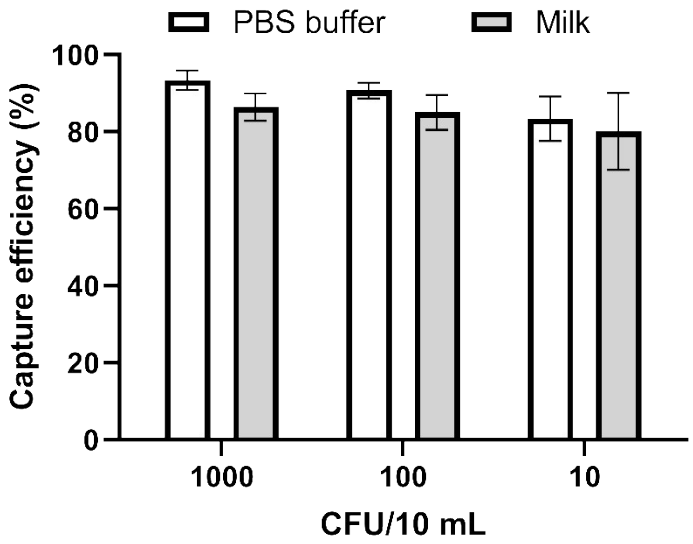


Figure S3. Capture efficiencies of Indole@MNPs with concentrations of *S.* Typhimurium (1000, 100, 10 CFU in 10 mL PBS buffer and milk). The original samples without binding with Indole@MNPs were counted as 100 % and served as controls. Error bars indicate standard deviation from mean based on three independent experiments.

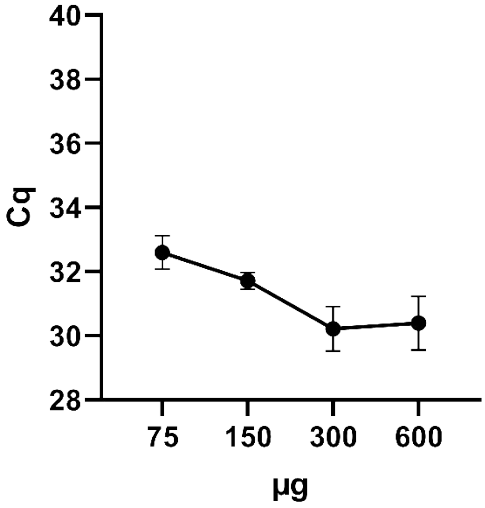
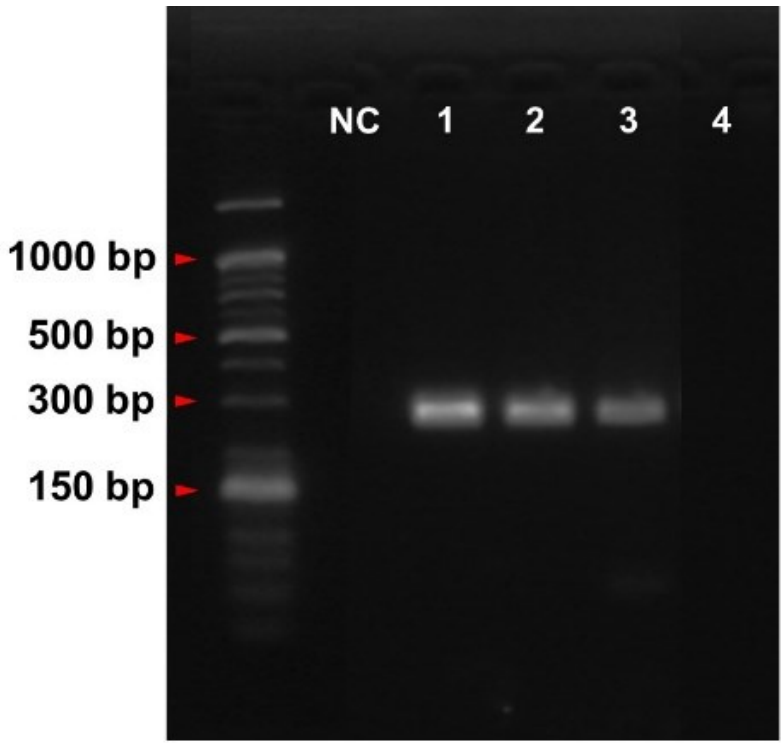


Figure S4. Evaluation of different Indole@MNP amounts in 10 mL PBS sample using 10^3 CFU of *S.* Typhimurium. Error bars indicate standard deviation from mean based on three independent experiments.



Figue S5. Gel electrophoresis image of PCR product. 25/100 bp mixed DNA ladder (Bioneer Inc.); NC: negative control with no DNA template; Lane 1: 1000 CFU/10 mL sample; Lane 2: 100 CFU/10 mL sample; Lane 3: 10 CFU/10 mL sample; Lane 4: 5 CFU/10 mL sample.

DLVO model

The potential interaction energy profile between *S.* Typhimurium and Indole@MNP was calculated based on the DLVO theory. [1-4] Following equations were used to make the computation:

$V_{Tot} = V_{LW} + V_{EL}$

$$V_{LW} = -\frac{A(a_1 a_2)}{6d(a_1 + a_2)}$$

$$V_{EL} = \frac{\pi \varepsilon a_1 a_2 (\zeta_1^2 + \zeta_2^2)}{(a_1 + a_2)} \left[\frac{2\zeta_1 \zeta_2}{\zeta_1^2 + \zeta_2^2} ln \frac{1 + exp(-kd)}{1 - exp(-kd)} + ln\{1 - \exp(-2kd)\} \right]$$

$V_{LW} =$ Electrical double layer repulsive energy

$V_{EL} =$ Van-der-Waals attractive energy

$V_{Tot} =$ DLVO energy barrier

$A =$ Hamaker constant where $A_{132} = \left(\sqrt{A_1} - \sqrt{A_3}\right)\left(\sqrt{A_2} - \sqrt{A_3}\right) = 1.40 \times 10^{-21} J$ for the interaction between bacterial pathogen $(A_1 = 5.2 \times 10^{-20} J)$ and iron oxide nanoparticle $(A_2 = 10 \times 10^{-21} J)$ separated by a water medium $(A_3 = 3.7 \times 10^{-20} J)$.

$a_1 =$ Radii of microbial cells; 770 nm for *Salmonella* Typhimurium

$a_2 =$ Radii of Indole@MNP (iron oxide nanoparticle) = 425 nm

$d =$ Separation distance: 0–3000 nm (dependent variable)

$\varepsilon = \varepsilon_0 \times \varepsilon_r = 7.083 \times 10^{-10} F/m$ where the relative permittivity of the medium, $\varepsilon_r = 80$ (for water at 20°C) and ther permittivity of a vacuum, $\varepsilon_0 = 8.854 \times 10^{-12} F/m$

$\zeta_1 =$ Zeta potential of bacteria where −11.7 mV for *Salmonella* Typhimurium

$\zeta_2 =$ Zeta potential of Indole@MNPs (pH 7)= −32 mV

$k =$ Inverse Debye-Huckel length = 729 nm for pH 6.5

References:

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(2) H. Ohshima, Interaction of colloidal particles. In Colloid and interface science in pharmaceutical research and development; Ohshima, H., Makino, K., Eds.; Elsevier, New York, 2002; pp 1–28.

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Table S2. An overview on recently reported MNP-based methods for the detection of *Salmonella* species.

Materials used	Detection method	Detection limit	References
Antibody functionalized MNPs	Multiplex PCR	10 CFU/ml (Pure culture) 100 CFU/ml (Meat)	[1]
Antibody functionalized MNPs	Fluorescence (DNA-QD-AuNP)	13.6 CFU/ml (PBS)	[2]
Antibody functionalized MNP chains	Electrochemistry	10 CFU/ml (Milk)	[3]
Aptamer functionalized MNPs	Chemiluminescence (Rolling circle amplification)	10 CFU/mL (PBS)	[4]
Aptamer functionalized MNPs	SERS	15 CFU/mL (PBS)	[5]
Oligonucleotide functionalized MNPs	RT-PCR	10 CFU/mL (Milk)	[6]
Indole functionalized MNPs	qPCR	10 CFU/10 mL (Milk)	This study

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