

Supplementary Materials for

**Integrating bacteriophage onto the magnetic nanozyme for  
effective enrichment and colorimetric detection of  
*Cronobacter sakazakii* in powdered infant formula**

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### *S1. Chemicals and reagents*

Phosphotungstic acid,  $\text{NH}_4\text{OH}$ , ascorbic acid,  $\text{CHCl}_3$ , 4-morpholineethanesulfonic acid (MES),  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ , N-hydroxy succinimide (NHS), ethanol, sodium acetate (NaAc), and acetic acid (HAc) were obtained from Sinopharm Chemical Reagent Co., Ltd. in China.  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ , 5, 5-dimethyl-1-pyrroline N-oxide (DMPO) and TMB were procured from Shanghai Aladdin Biochemical Technology Co., Ltd in China. 1-(3-Dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride ( $\text{EDC} \cdot \text{HCl}$ ) was purchased from Shanghai McLean Co., Ltd in China. Nutrient broth (NB), Luria-Bertani (LB), agar powder medium, and *C. sakazakii* chromogenic medium (DFI agar) were procured from Huankai Microbial Sci. & Tec. Co., Ltd. in China. SYBR-Gold nucleic acid gel stain and 4', 6-diamidino-2-phenylindole (DAPI) were purchased from Thermo Fisher Technology Co., Ltd. in China. All chemicals and reagents were used as received without further purification unless otherwise stated. Deionized water was utilized throughout the study.

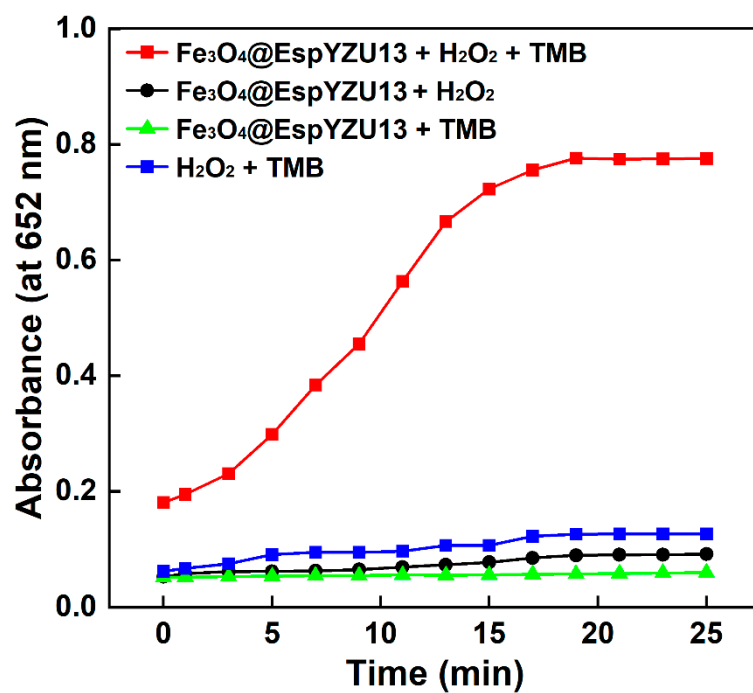


Figure S1. Reaction time-dependent absorbance (652 nm) change of four reaction systems.

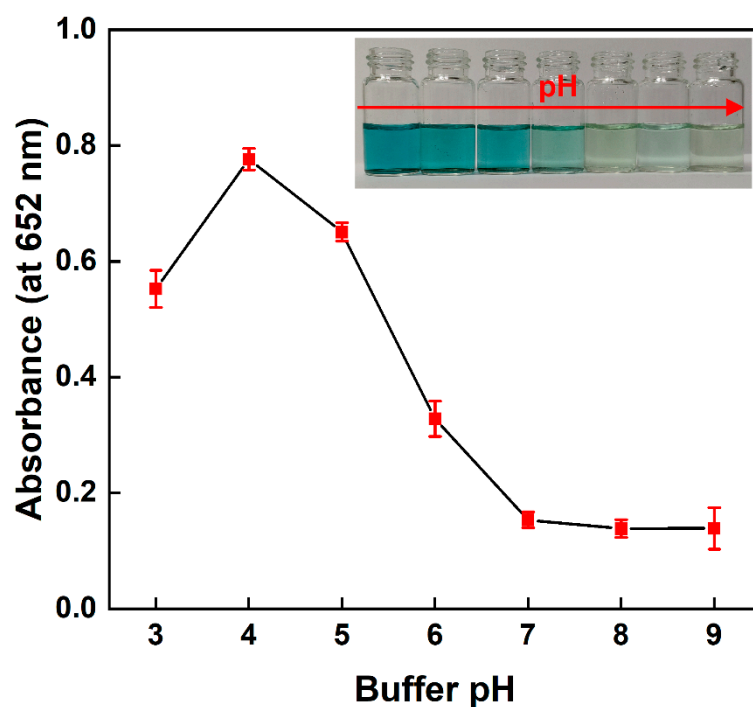


Figure S2. Effect of buffer pH on the peroxidase-like activity of Fe<sub>3</sub>O<sub>4</sub>@EspYZU13.

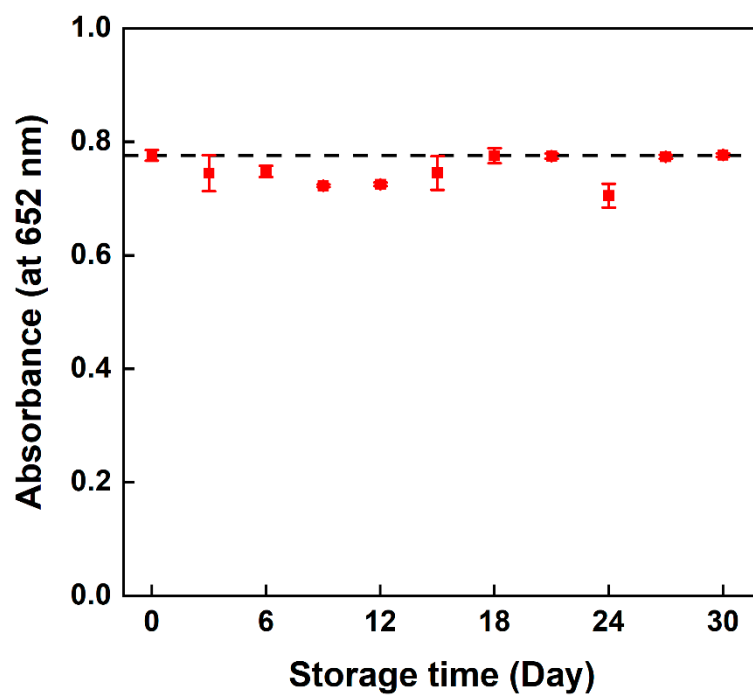


Figure S3. Storage stability of Fe<sub>3</sub>O<sub>4</sub>@EspYZU13.

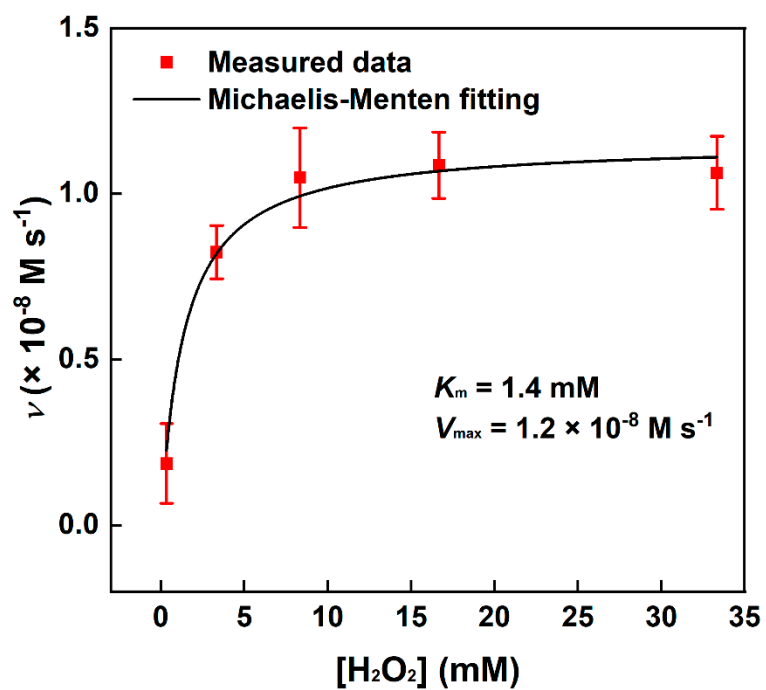


Figure S4. Steady-state kinetics of Fe<sub>3</sub>O<sub>4</sub>@EspYZU13 using H<sub>2</sub>O<sub>2</sub> as substrate.

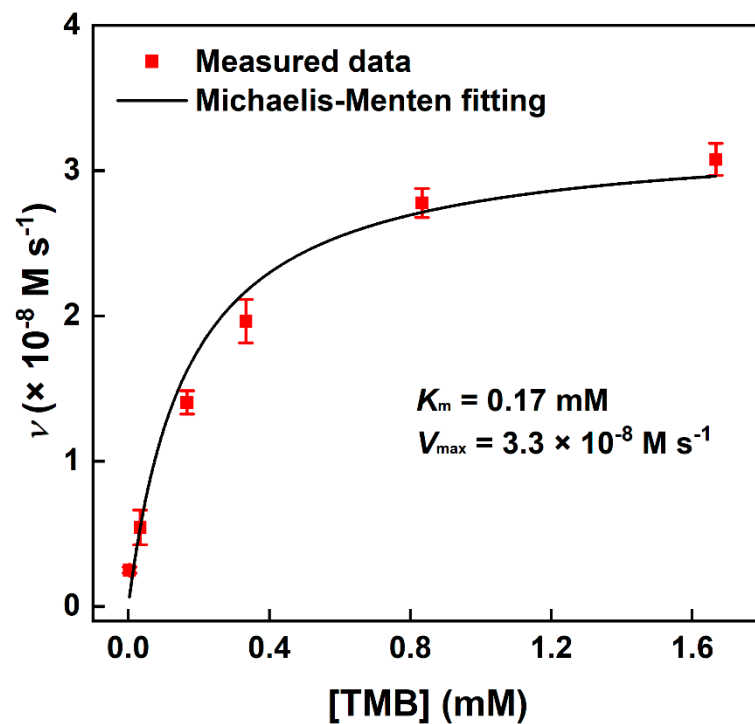


Figure S5. Steady-state kinetics of EspYZU13@Fe<sub>3</sub>O<sub>4</sub> using TMB as substrate.

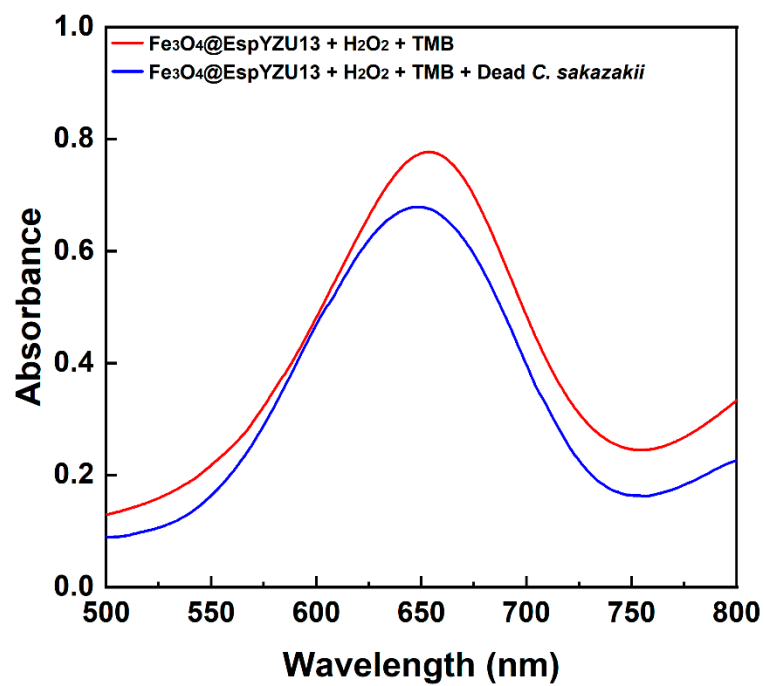


Figure S6. Absorbance of Fe<sub>3</sub>O<sub>4</sub>@EspYZU13 + H<sub>2</sub>O<sub>2</sub> + TMB reaction system with dead *C. sakazakii*.

**Table S1.** Comparison of kinetic parameters between Fe<sub>3</sub>O<sub>4</sub>@EspYZU13 and the previously reported peroxidase-like nanozymes.

Nanozyme	$K_m$ (mM)		$V_{max}$ ( $\times 10^{-8}$ M s <sup>-1</sup> )		Ref.
	H <sub>2</sub> O <sub>2</sub>	TMB	H <sub>2</sub> O <sub>2</sub>	TMB	
SapYZU15@Fe <sub>3</sub> O <sub>4</sub>	11.5	6.0	2.2	16.3	[1]
EspYZU15@Pd	8.3	0.6	1.9	9.1	[2]
Fe <sub>3</sub> O <sub>4</sub> @EspYZU13	1.4	0.17	1.2	3.3	This work

**Table S2.** Comparison of detection performance of our proposed Fe<sub>3</sub>O<sub>4</sub>@EspYZU13 + H<sub>2</sub>O<sub>2</sub> + TMB reaction system with other previously reported methods.

Material	Method	Detection range (CFU mL <sup>-1</sup> )	LOD (CFU mL <sup>-1</sup> )	Ref.
GO/Au	Electrochemistry	$2 \times 10^2 \sim 2 \times 10^7$	20	[3]
mAb-Au-PATP	SERS	$10^2 \sim 10^7$	201	[4]
DNAzyme	Electrochemistry	$3.84 \times 10^4 \sim 2.4 \times 10^7$	501	[5]
EspYZU15@Pd	Colorimetry	$3.2 \times 10^2 \sim 3.2 \times 10^7$	36	[6]
Fe <sub>3</sub> O <sub>4</sub> @EspYZU13	Colorimetry	$3.2 \times 10^1 \sim 3.2 \times 10^7$	26	This work

## Reference

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