Rapid detection of carbapenem-resistant Enterobacteriaceae by pH response based on vancomycin-modified Fe_3O_4@Au nanoparticles enrichment and carbapenemase hydrolysis reaction

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Table S1 Results of antibiotic susceptibility test of carbapenems on the clinical isolation carbapenem-resistant Enterobacteriaceae strains.

Specimen no.	Species[1]	MIC (μg·mL^{-1}) of:	
		Imipenem	**Ertapenem**
24733	*E. coli*	> 16	> 8
30172	*E. coli*	> 16	> 8
31211	*E. coli*	> 16	> 8
30983	*K. pn*	> 16	> 8
31662	*K. pn*	> 16	> 8
38374	*K. pn*	> 16	> 8

[1] *E. coli, Escherichia coli; K. pn, Klebsiella pneumoniae.*

Characterization of Fe_3O_4NPs and Fe_3O_4@Au@VanNPs

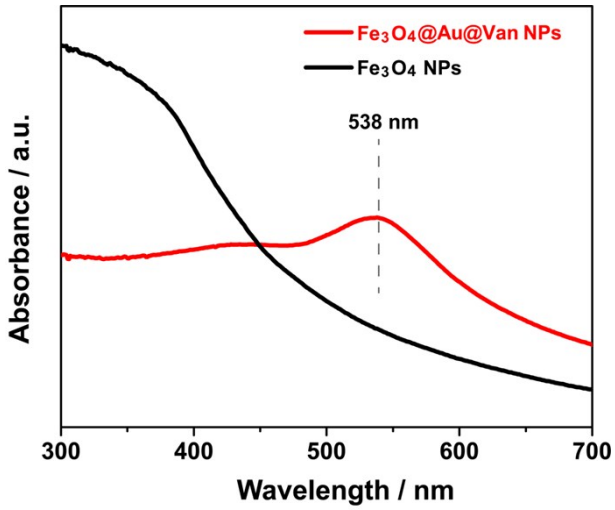

Figure S1. UV-vis spectra of Fe_3O_4NPs and Fe_3O_4@Au@VanNPs.

Capture effect of Fe_3O_4@Au@VanNPs for two Enterobacteriaceae strains

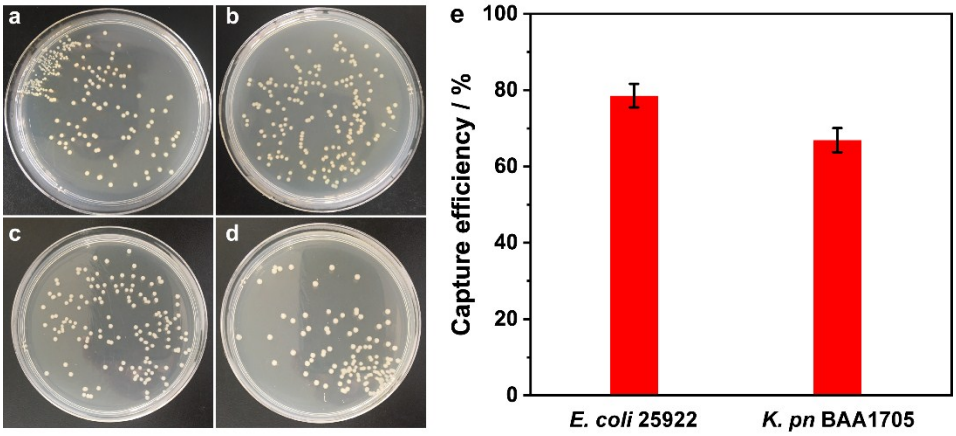

Figure S2. (**a**) Photograph of the colony-forming units by *E. coli* 25922 in a dilute suspension on LB agar plate. (**b**) Photograph of the colony-forming units by *E. coli* 25922 in a dilute suspension on LB agar plate after treatment with of Fe_3O_4@Au@VanNPs. (**c**) Photograph of the colony-forming units by *K. pn* BAA1705 in a dilute suspension on LB agar plate. (**d**) Photograph of the colony-forming units by *K. pn* BAA1705 in a dilute suspension on LB agar plate after treatment with of Fe_3O_4@Au@VanNPs. (**e**) Capture efficiency of Fe_3O_4@Au@VanNPs for two Gram-negative Enterobacteriaceae strains. Error bars indicate the standard deviation of three independent experiments.

Optimization of experimental conditions

Optimization of Fe_3O_4@Au@VanNPs concentration

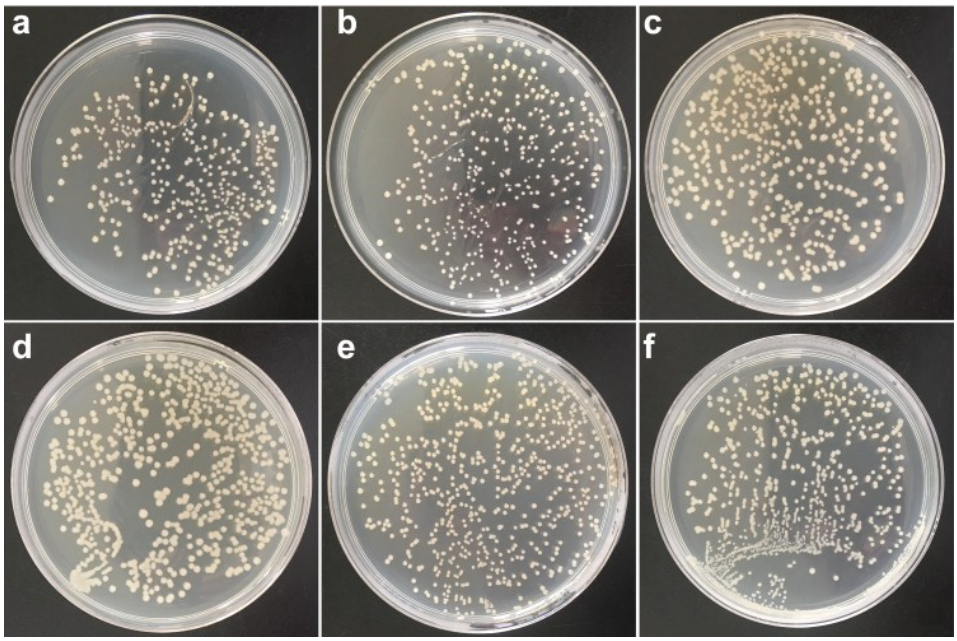

Figure S3. (**a-e**) Photographs of the colony-forming units by *K. pn* BAA1705 in a dilute suspension on LB agar plates after treatment with different dosages of Fe_3O_4@Au@VanNPs (0.2, 0.4, 0.8, 1.2, 1.6 $mg \cdot mL^{-1}$). (**f**) Photograph of the colony-forming units by *K. pn* BAA1705 in a dilute suspension on LB agar plate.

Optimization of incubation time

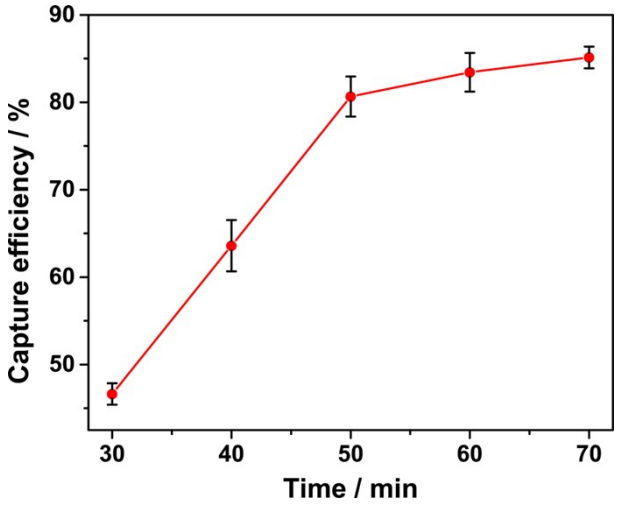

Figure S4. Effects of the incubation time of Fe_3O_4@Au@VanNPs binding with *E. coli* 24733. Error bars indicate the standard deviation of three independent experiments.

Verification of the urine samples

Bacteria culture of the urine samples

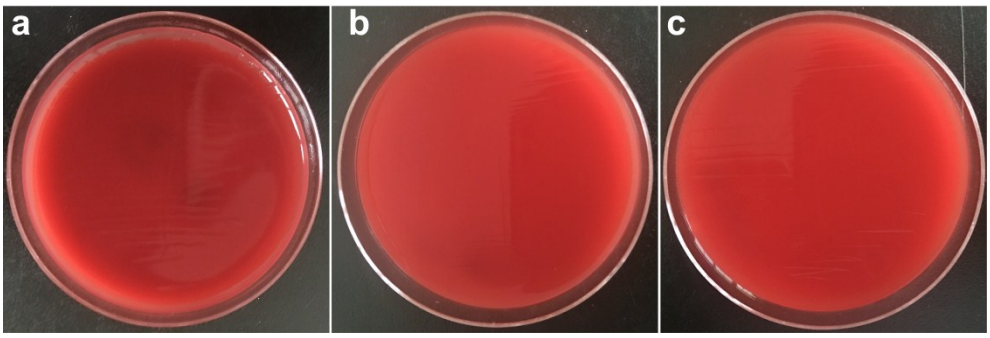

Figure S5. (**a-c**) Photographs of bacteria culture for urine samples with various pH (6.0, 7.0, 7.5) on blood agar plates after 24 h incubation.

CRE test of urine samples with various original pH

In order to verify the influence of original pH of urine samples on CRE test, we prepared CRE test samples by spiked *K. pn* BAA1705 with various urine samples (1.0×10^5 cfu · mL^{-1}). As shown in Figure S6, the pH of CRE test had no significant difference among the urine samples with various pH.

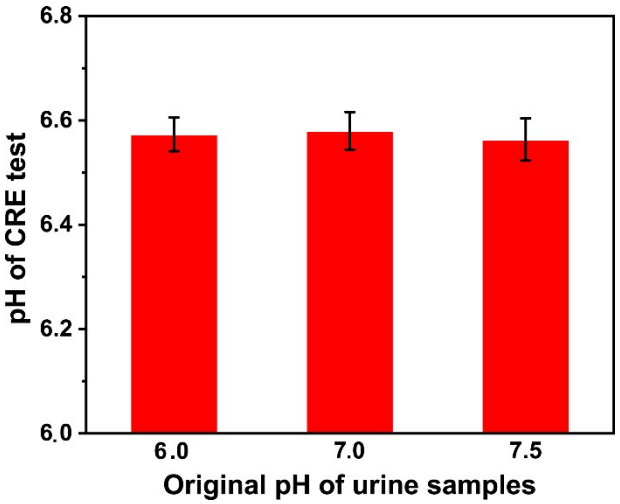

Figure S6. CRE test of urine samples with various original pH (6.0, 7.0, 7.5, contained 1.0×10^5 cfu · mL^{-1} *K. pn* BAA1705). Error bars indicate the standard deviation of three independent experiments.