Electronic Supplementary Material (ESI) for Analytical Methods.
This journal is © The Royal Society of Chemistry 2020

Supplementary materials

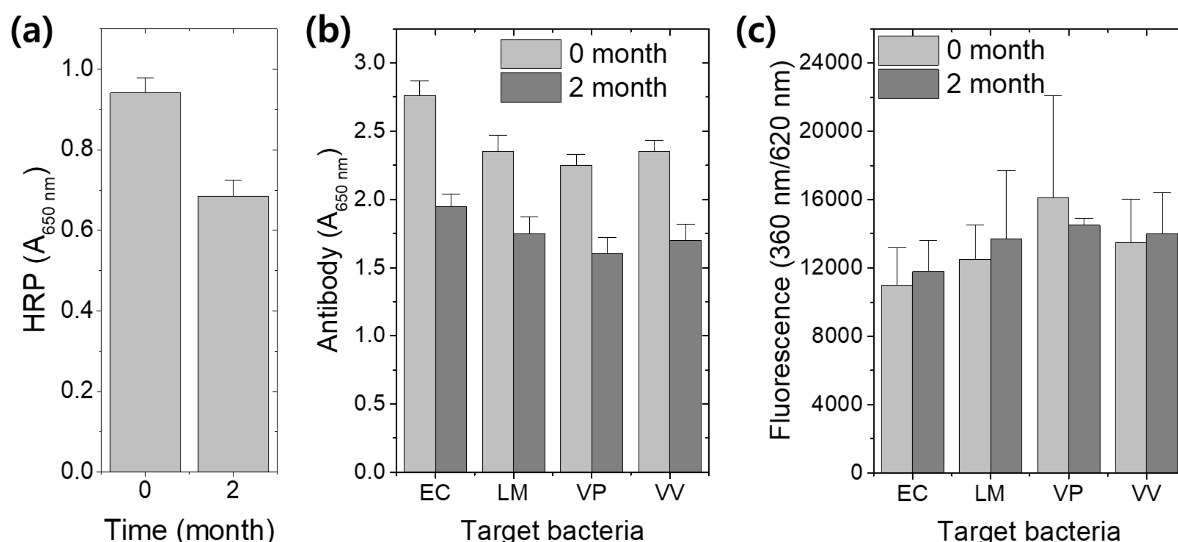

Fig. S1. Stability of particles during storage. (a) Horseradish peroxidase (HRP) was immobilized on 300-nm carboxyl-modified silica nanoparticles (SNPs) using a chemical method involving 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide. The HRP-SNP complex was stored in HRP-stabilizing buffer (Thermo Fisher Scientific, Waltham, MA, USA) at 4 °C. HRP activity of the particles was measured at 0 and 2 months. (b) Labeling particles (LPs) were prepared similarly using 300-nm europium-chelate nanoparticles (EuNPs) and antibody to each bacterial strain. The particles were stored in PBST (phosphate-buffered saline with 0.01% Tween-20) at 4 °C. Immobilization status of the antibody was estimated using a secondary antibody, namely HRP anti-rabbit immunoglobulin G antibody, at months 0 and 2. (c) Binding activity of the LPs were estimated at 0 and 2 months by adding LPs to immunoplate wells coated with approximately 10^7 CFU of different bacterial cells; EC, *Escherichia coli*; LM, *Listeria monocytogenes*; VP, *Vibrio parahaemolyticus*; VV, *V. vulnificus*. LPs (10 µg) were added to the wells and incubated at 25 °C for 1 h with shaking. Bound LPs were estimated by measuring the fluorescence of EuNPs after washing off unbound particles.

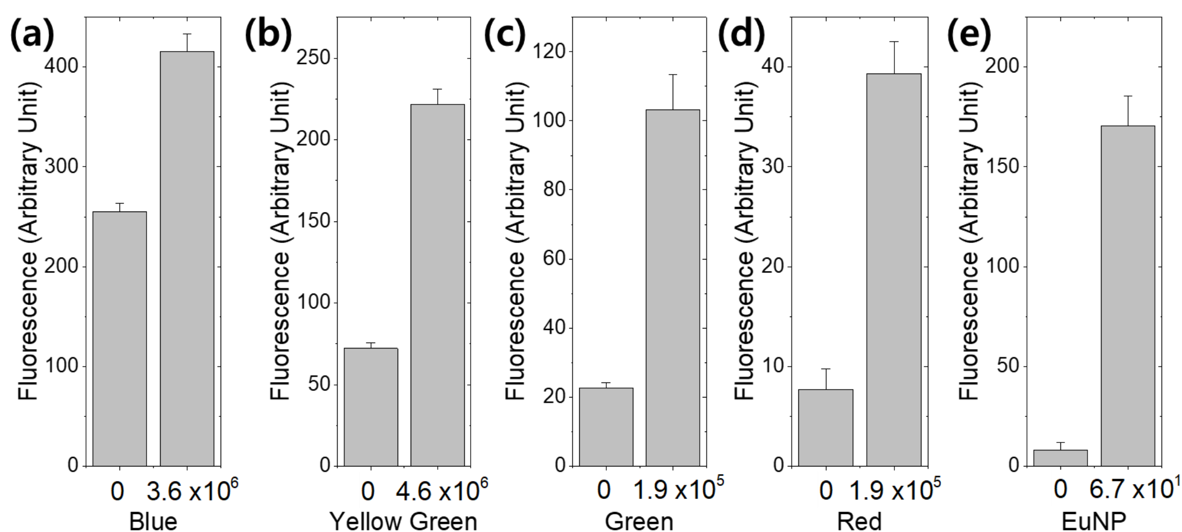

Fig. S2. Determination of the least detectable number of fluorescent particles. (a) blue fluorescent nanoparticles, (b) yellow-green fluorescent nanoparticles, (c) green fluorescent nanoparticles, (d) red fluorescent nanoparticles, and (e) europium-chelate fluorescent nanoparticles. Fluorescence was measured using a Synergy-HT plate reader (BioTek, Winooski, VT, USA). The abscissa represents the number of particles.

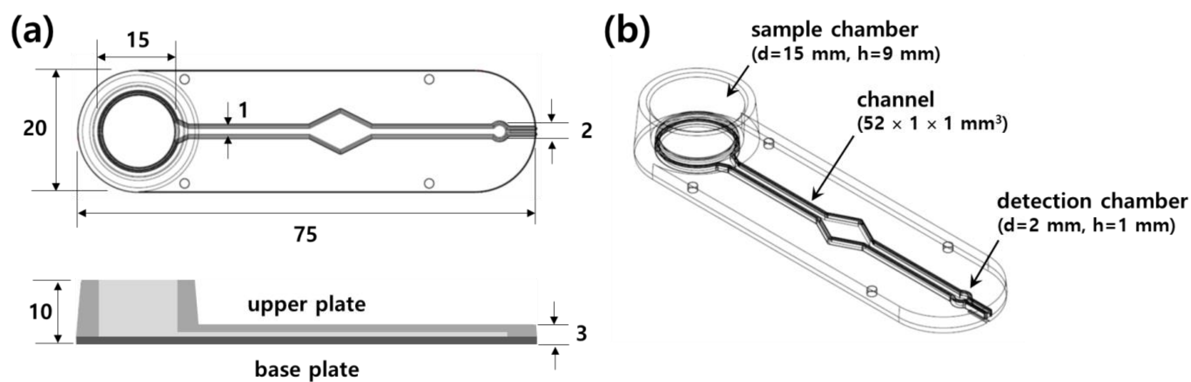

Fig. S3. Structure and dimensions (mm) of the assay chip; cross-sectional view (a) and three-dimensional view (b).

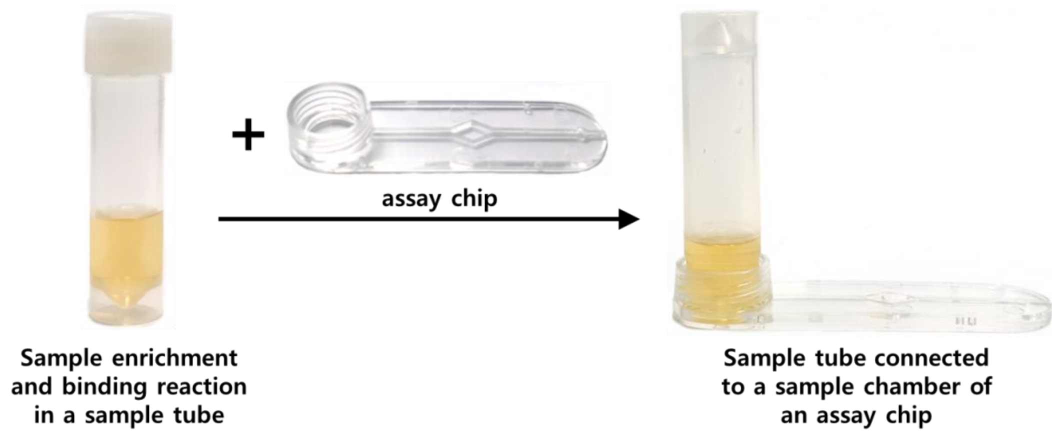

Fig. S4. Schema of the assay process. Sample enrichment followed by coupling of the sample tube to an assay chip.

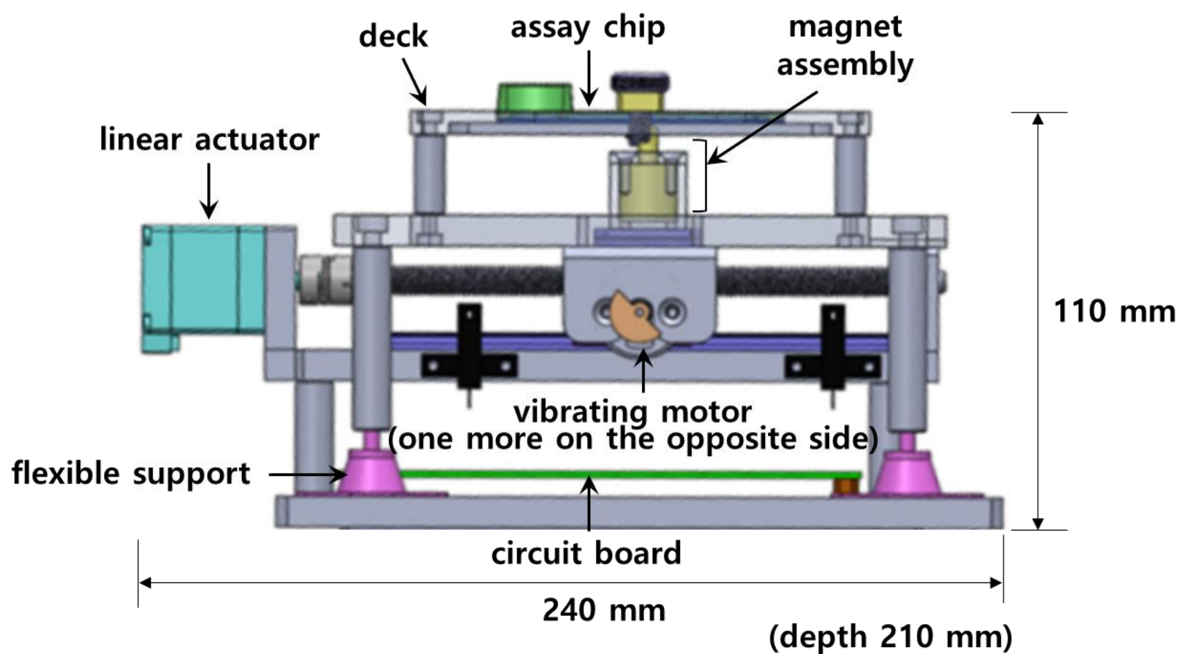

Fig. S5. Structure and dimensions of the assay device. Two cylindrical vibrating motors (DC 6 V, diameter 24.4 mm, length 30.8 mm, 7600 rpm) were installed on both sides of the device to apply homogeneous vibrations across the deck.

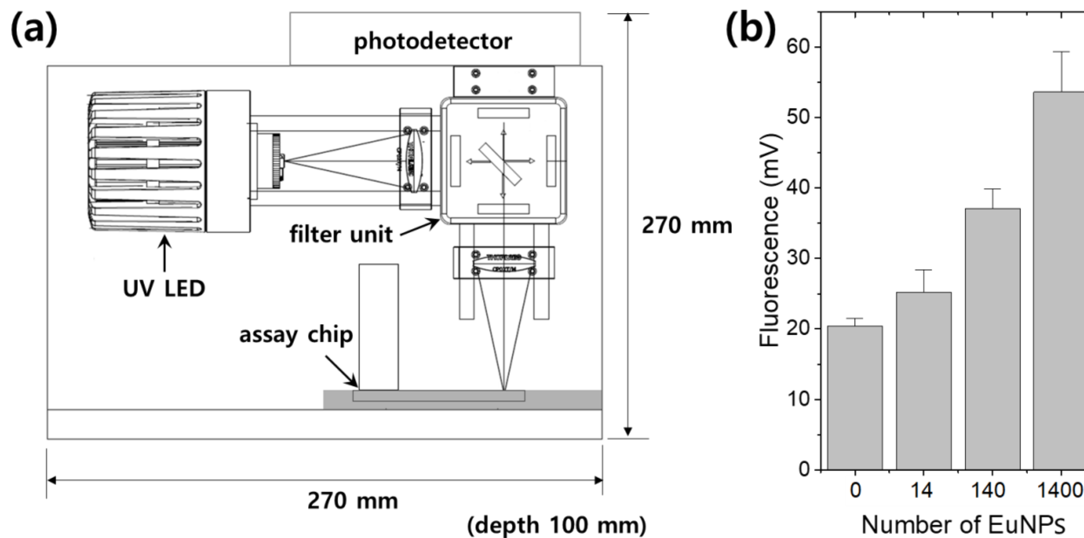

Fig. S6. Portable fluorimeter. (a) Structure and dimensions of the portable fluorimeter. (b) Fluorescence intensity of europium-chelate fluorescent nanoparticle (EuNP) dilutions measured with the portable fluorimeter.

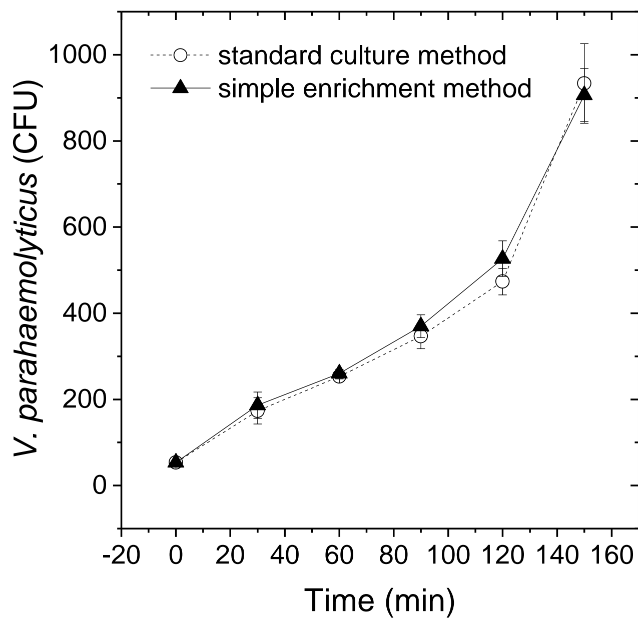

Fig. S7. Comparison of growth rate between simple enrichment and standard culture methods.

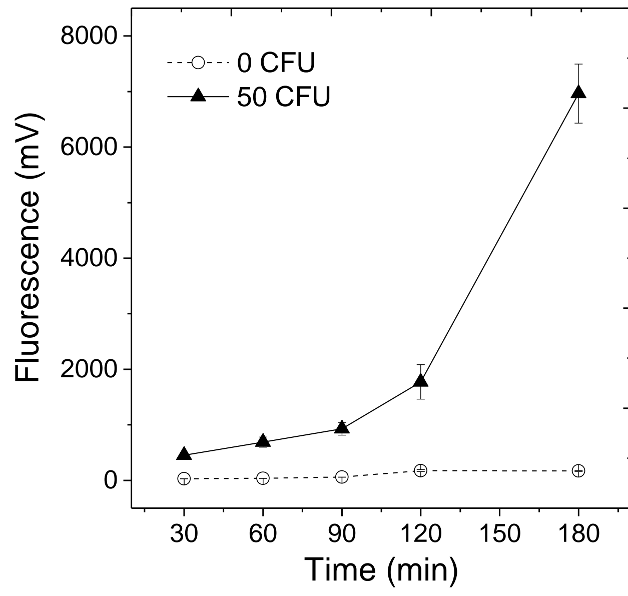

Fig. S8. Signal amplification by sample enrichment.