Electronic Supplementary Material (ESI) for Lab on a Chip
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Supplementary Information: Serial Dilution via Surface Energy Trap-Assisted Magnetic Droplet Manipulation

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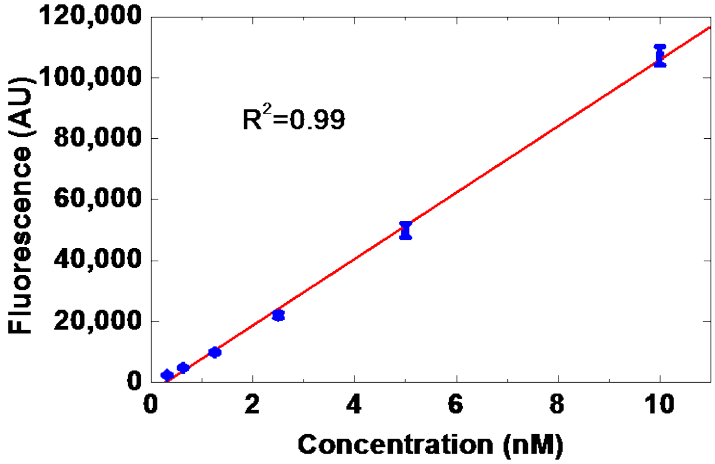


Fig. S1. Fluorescein calibration curve. The fluorescent intensity is proportional to the concentration in the shown range.

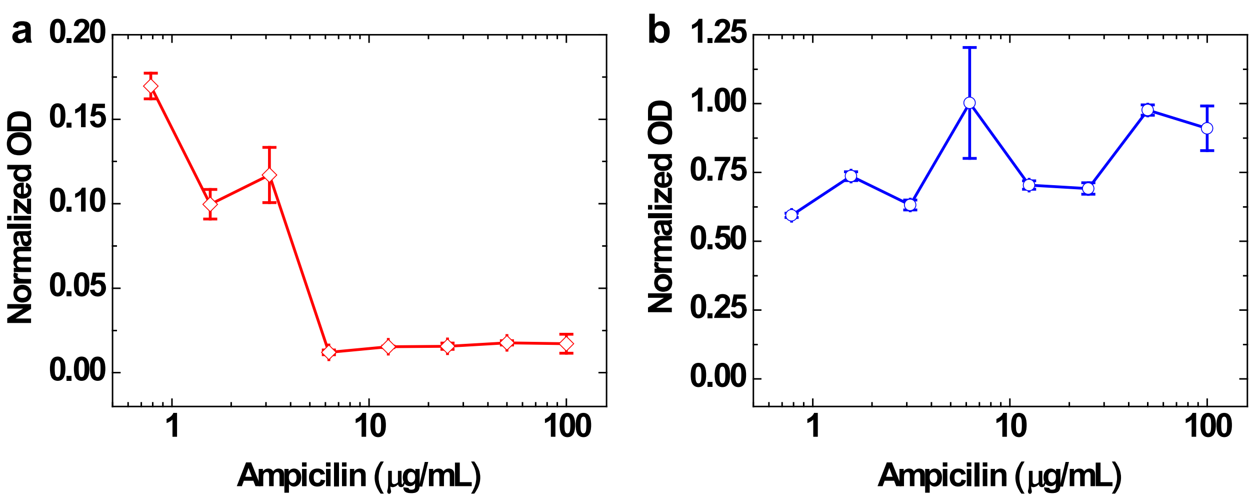
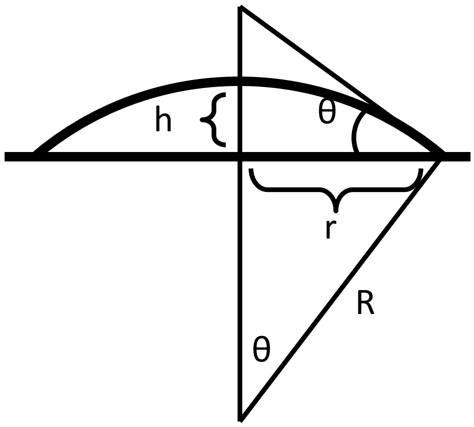


Fig. S2. AST control experiment performed in tube. (*A*) Resistant strand and (*B*) susceptible strand.

Deviation of Equation (2)



Assume the droplets is a spherical cap

The volume of the spherical cap $\boldsymbol{V_{cap}}$

$$V_{cap} = \frac{\pi}{3} h^2 (3R - h) \tag{S1}$$

Since

$$R - h = R\cos\theta \tag{S2}$$

and

$$r = R\sin\theta \tag{S3}$$

Substitute (S3) and (S2) in to (S1)

$$V_{cap} = \frac{\pi}{3} r^3 \left(\frac{2 - 3\cos\theta + \cos^3\theta}{\sin^3\theta} \right) \tag{S4}$$

$$\Rightarrow \log V_{cap} = 3r + f(\theta) \tag{2}$$

where

$$f(\theta) = \log\frac{\pi}{3} \left(\frac{2 - 3\cos\theta + \cos^3\theta}{\sin^3\theta} \right) \tag{S5}$$

Derivation of the Equation (3)

It is known that

$$\frac{V_n}{V_n + V_w} = \frac{DV_{n+1}}{V_{n+1} + V_w} \tag{S6}$$

where V_{n+1} and V_w are the volumes of the $(n+1)^{st}$ droplet and the dilution buffer droplet, respectively. The 1^{st} droplet is defined as the one with highest concentration in the serial dilution, and D is the dilution factor.

$$V_{n+1} = \frac{V_w}{Dm_n + D - 1} \tag{S7}$$

where $m_n = \frac{V_w}{V_n}$ **,** which is the volume ratio of the dilution buffer droplet to the n^{th} droplet

Now prove Equation (7) by induction

$$V_{n+1} = \frac{V_w}{D^n m_1 + D^n - 1} \tag{3}$$

For n=1

$$V_2 = \frac{V_w}{Dm_1 + D - 1} \tag{S8}$$

Assume it is true for for n=p,

$$V_{p+1} = \frac{V_w}{D^p m_1 + D^p - 1} \tag{S9}$$

Then for n=p+1

$$V_{p+2} = \frac{V_w}{Dm_{p+1} + D - 1} \tag{S10}$$

where $m_{p+1} = \frac{V_w}{V_{p+1}}$

Then

$$V_{p+2} = \frac{V_w}{D\dfrac{V_w}{\dfrac{V_w}{D^p m_1 + D^p - 1}} + D - 1} \tag{S11}$$

$$\Rightarrow V_{p+2} = V_{(p+1)+1} = \frac{V_w}{D^{p+1}m_1 + D^{p+1} - 1} \tag{S12}$$

Hence

$$V_{n+1} = \frac{V_w}{D^n m_1 + D^n - 1} \tag{3}$$

Proved.