Supporting Information

Development of a microfluidic microbioreactor for microbial cultivation

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Number of Figures in SI: 4
Number of Videos in SI: 1

S.1 Droplet sorting graph

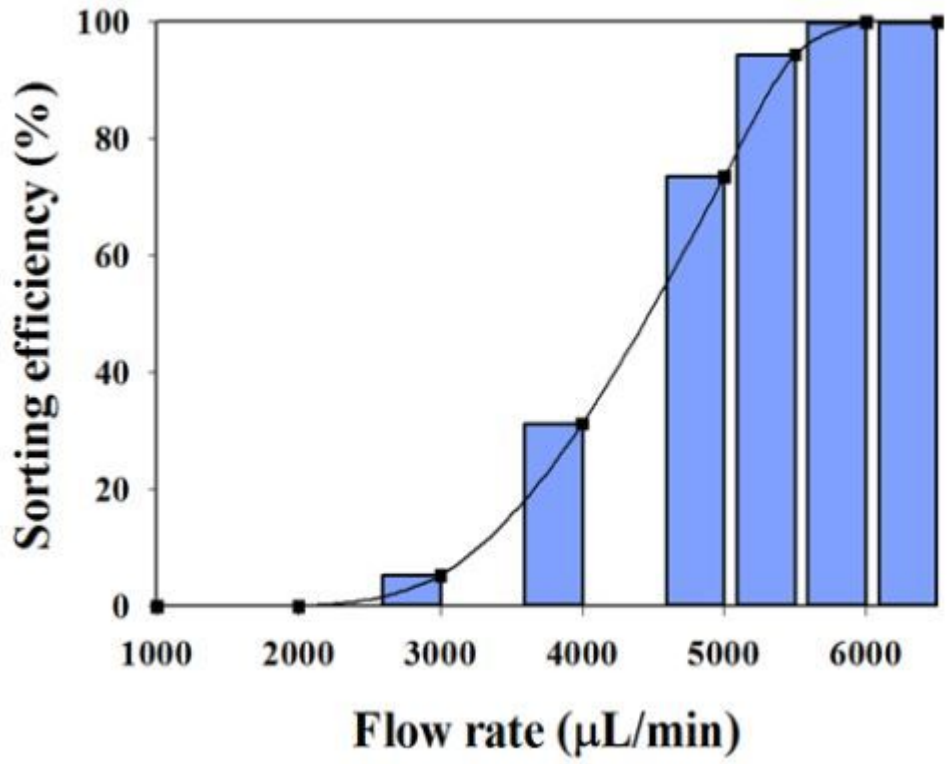

Figure S1. Droplet sorting efficiency into the upper channel using different secondary oil flow rates. As the flow rate increase more droplets get sorted into the upper channel.

S.2 Image processing procedures

3.1 Droplet size

Droplet size were determined by using software Adobe Photoshop and ImageJ. Individual droplets were trapped in the chamber of the microfluidic device. A standard scale bar was created by measuring the length of microfluidic channel using photoshop. Number of pixels and the dimension of droplet were calculated by the ruler tool from the software. Values were obtained and image of droplet were then imported into the software ImageJ. Image J calculated automatically the size of individual droplets.

3.2 Fluorescence intensity

Bright field image and fluorescent image of the same droplet was opened in Adobe photoshop. Droplets cut off the droplet and saved as two new images. The new fluorescent image was then opened at ImageJ. The type of the image was firstly changed to 8 bit. Afterwards, the threshold of the image was adjusted until all bacterial was shown as bright red and the back ground was black. The image was then analyzed by the software by setting the size as 150-infinity. Afterwards, the software can calculate the fluorescence intensity based on the new image.

S.3 Other camera settings

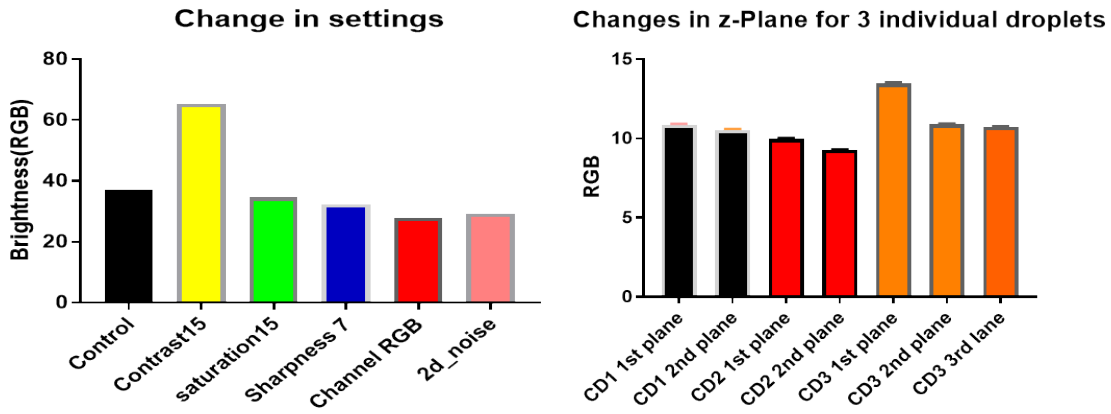

Figure S2. Droplet sorting efficiency into the upper channel using different secondary oil flow rates. As the flow rate increase more droplets get sorted into the upper channel.

S.4 R^2 plot between voltage and fluorescence for electrical fields

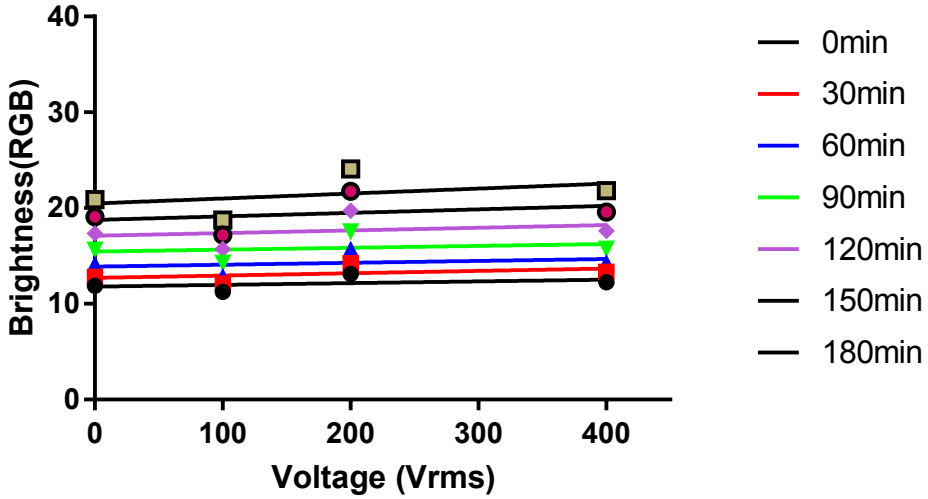

Figure S3. **R^2 plot between Voltage and fluorescence for electrical fields. As gradients of individual slopes are almost similar, this shows that voltages does not affect the fluorescence for this experiment.**

S.5 Video of droplet oscillation at different frequency 0.5Hz, 1Hz and 100Hz

Video of droplet oscillations using three different amplitude modulated AC signals of 0.5Hz, 1Hz and 100Hz. The voltage and AC frequency used are standardized at 5Vpp and 50kHz (Video S1).

S.6 Droplet size after 6hrs

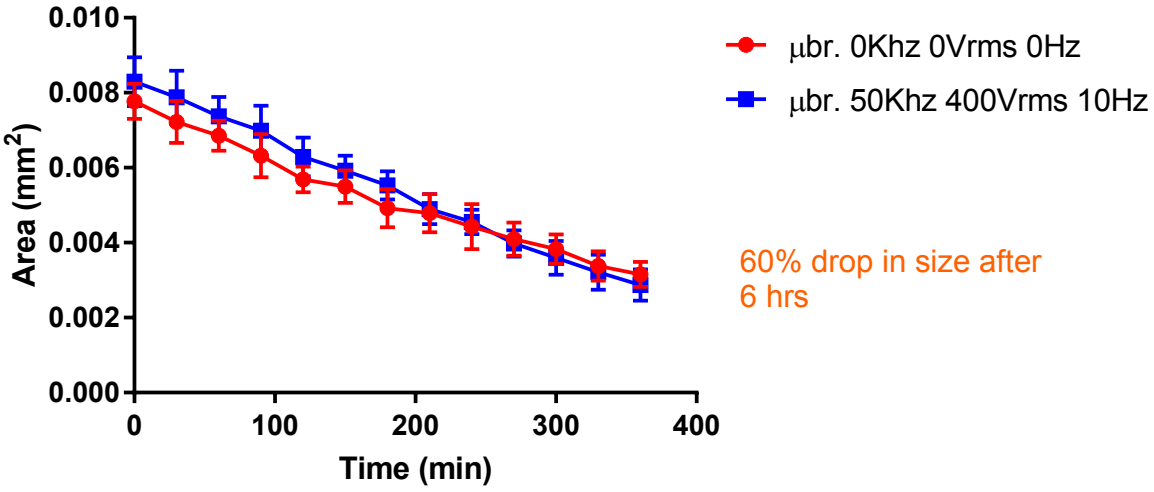

Figure S4. Droplet size over a 6hr period at 50KHz 400Vrms 10Hz.