

Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: 3D rendering of the microfluidic device. The movie shows a 3D render of the chamber array arrangement, with the overlapping pressure channel.

File Name: Supplementary Movie 2

Description: Deformation of chamber membrane from colony growth. The movie shows the deformation of the membrane (black area between blue (Alexa Fluor 647) and green (GFP-expressing *E. coli*) layers) as a result of colony expansion within confinement. Scale bar, 20 μm .

File Name: Supplementary Movie 3

Description: Colony growth. The movie shows the time-lapse capture of colony growth within chamber. Scale bar, 40 μm .

File Name: Supplementary Movie 4

Description: Z-scan of a full chamber with deformed membrane. The movie shows a confocal z-stack of a fully expanded chamber. Note the “butterfly shape” spatial distribution of GFP as a reporter of *rpoH* expression. Scale bar, 40 μm .

File Name: Supplementary Movie 5

Description: Simulation of colony in chamber. The movie shows the model simulation of growth and stress response profile within growth chamber with deformable roof.

File Name: Supplementary Movie 6

Description: Simulation of colony in hydrogel. The movie shows the model simulation of growth and stress response profile within hydrogel