

Supporting Information

Osmotic-Engine-Driven Liposomes in Microchannels

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S.1. Liposome formation by a water-in-oil emulsion centrifugation method

Aqueous buffered solutions (1.0 M KCl, 10 mM MOPS, pH 7.0) with and without 0.1 mg/mL calcein were prepared as inner and outer solutions, respectively. Then, 300 μL of a lipid/oil mixture in which DOPC, DOPS, and chol were dissolved in liquid paraffin at a molar ratio of 9:1:3 was prepared. 300 μL of the outer solution and 100 μL of the lipid/oil mixture were layered in a microtube and incubated at 4 $^{\circ}\text{C}$ for 60 min. 10 μL of the inner solution was added to 200 μL of the lipid/oil mixture and mixed by vortex for 30 s to prepare W/O emulsions. The emulsions were added to the layered solution and centrifuged at 18,800 g for 15 min. The precipitated liposomes were collected with a micropipette. When the microbeads-encapsulated liposomes were prepared, Rhod PE was dissolved in the lipid/oil mixture at a molar ratio of 1000:1 (DOPC:Rhod PE).

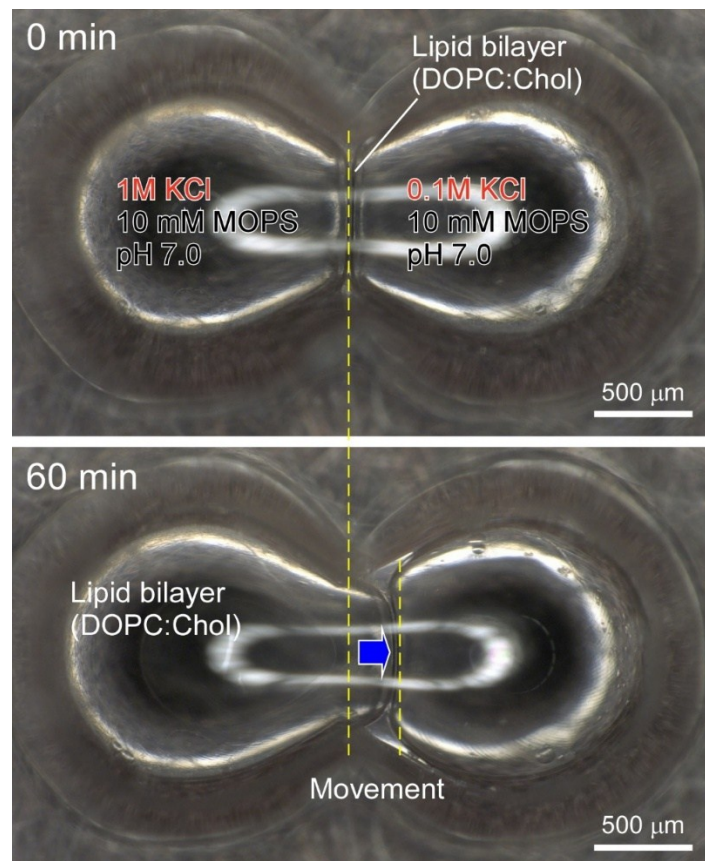


Fig. S1 Microscopic images of lipid membrane (DOPC:Chol) deformation with a salt concentration difference (1 M : 0.1 M KCl) at each droplet.

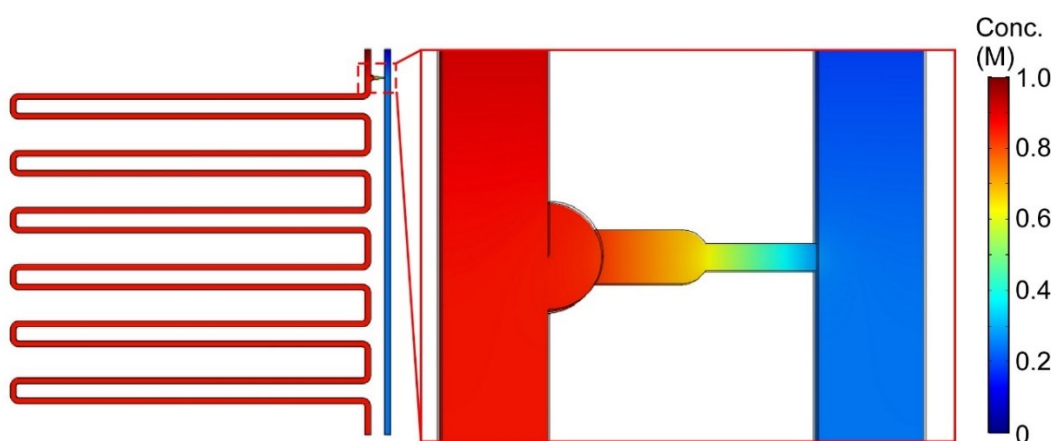


Fig. S2 Result of hydrodynamic simulation of the salt concentration when a liposome was not trapped in the narrow channel.

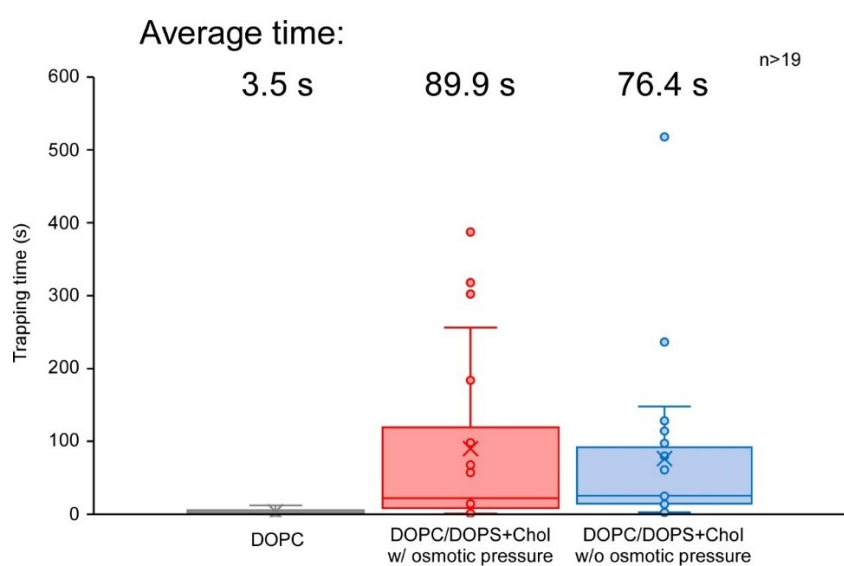
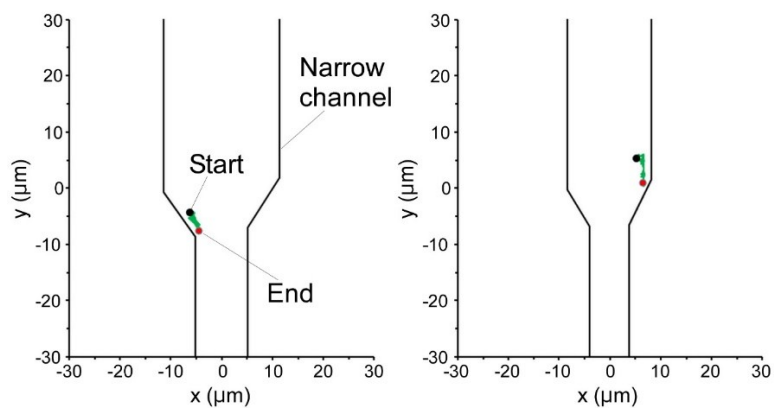


Fig. S3 Comparison of trapping durations of liposomes formed by DOPC and DOPC/DOPS+ cholesterol. The trapping duration of the liposome increased by changing the lipid composition of liposomes from “DOPC” to “DOPC/DOPS+ cholesterol”. In addition, there is no significant differences between with and without osmotic pressure differences.

W/o salt concentration difference



W/ salt concentration difference

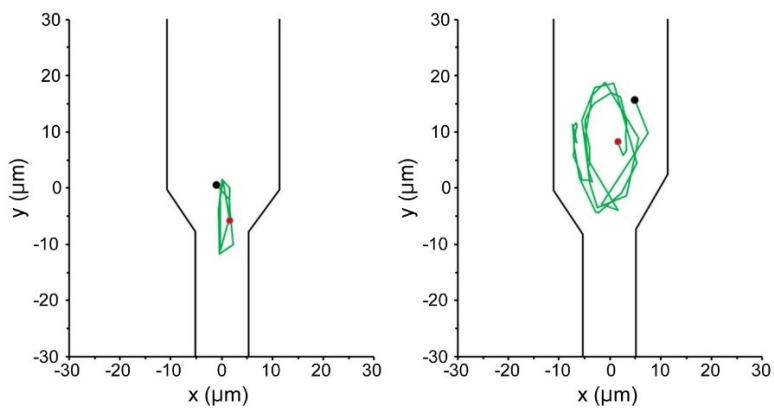
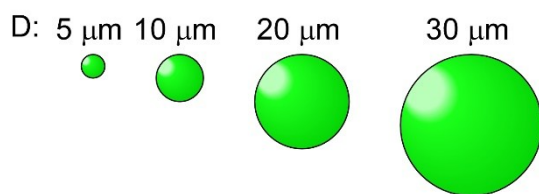


Fig. S4 Results of bead tracking with and without a salt concentration difference.

Liposome size



Channel dimensions

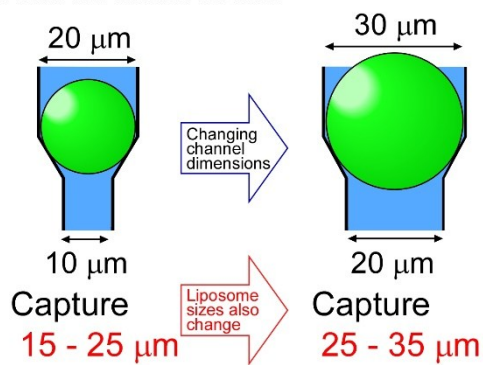


Fig. S5 Relationship between the liposome size and channel dimensions for capturing liposomes.