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Manipulation and stretching of bacteria and liposomes by Microfluidics EYAL ZUSSMAN, WAEL SALALHA, Faculty of Mechanical Eng., Technion, Israel — Microfluidic technology can be useful in lab-on-a-chip applications of biological assays, environmental monitoring, detection of toxic materials, as well as for assembly of nano- and micro-scale objects into more complex systems. In this work we focused on the orientation of rod-shaped bacteria (Bacillus) by employing shear flow and a high rate elongation flow, and stretching of giant liposomes with diameter size of tens of microns, which can be used as a simplified model for cell behavior. This was achieved by flows of dilute rod-like bacteria and liposome suspensions within a micro-channel by means of a capillary-driven motion. Fluidic alignment situations were tested, firstly by Venturi-like flow which produces a sufficiently converging and diverging flow, and secondly by sink-like flow in a converging microchannel. In the first method we found that the converging part of the flow aligns rod-like bacteria, whereas the diverging part disaligns them, while in the second method the rod-like bacteria can perfectly align along the streamlines. In addition we used the same technology to test liposome deformation while they are flowing through a Venturi-like microchannel. The microfluidics devices were fabricated from poly(dimethylsiloxane) (PDMS) by soft lithographic techniques.

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