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Biophysical investigation of lipid droplet fusion MONA MIRHEYDARI, Department of Physics, Kent State University, CHIRAN GHIMIRE, HUNBIN MAO, Department of Chemistry and Biochemistry, Kent State University, ELIZABETH K. MANN, Department of Physics, Kent State University, EDGAR E. KOOIJMAN, Department of Biological Sciences, Kent State University — Lipid droplets are important intracellular organelles. Aside from maintaining internal energy stability these intracellular organelles function in processes as diverse as lipid signaling, synthesis of steroid hormones and viral replication. Lipid droplets mature through cell processes like fusion. Recently, we showed that oil droplet fusion can be followed via a specially designed optical trap method whereby two oil droplets are captured in two traps, then brought together. The top trap is turned off so that oil droplets join in the bottom trap. The process of merging within the trap can be separated into two stages: (a) A docking stage which depends strongly on the concentration of ions in the solution and type of anion in solution according to the Hoffmeister series; (b) The physical fusion of the two droplets. To further investigate mechanism of the observed behavior, especially effect of ions, we used a home-built liquid droplet tensiometer to determine the interfacial tension of an oil droplet in solution and its dependence on the type of anion and its concentration. Results show that interfacial tension alone cannot explain the fusion of lipid droplet. The interfacial tension does not significantly change from 10 to 50 mM ion concentration, while the docking rate of oil droplet fusion increases 10 fold. The interfacial tension also shows no trend with the Hoffmeister anion series.

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