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Modeling Mechanotunable Transmembrane Transport in Lipid Vesicles ISAAC G. SALIB, OLGA KUKSENOK, ANNA C. BALAZS, University of Pittsburgh, Pittsburgh, PA 15261, USA — Using Dissipative Particle Dynamics approach, we study the effects of applied stress on transmembrane transport in lipid vesicles. The lipids comprising the vesicle are composed of a hydrophilic head group and two hydrophobic tails. The vesicle is immersed into the hydrophilic solution and initially contains a number of amphiphilic species inside its cavity. We show that such enclosed species can be released "on demand" by vesicle's stretching. We find that the magnitude of the external force required to release the vesicle's content depends on the chemical nature and volume fraction of the enclosed species. Furthermore, we isolate the scenarios where the stretching of the lipid vesicle depleted of the enclosed species results in its "refilling" with the fresh species from the outer solution. Our results illustrate that applied mechanical stress provides an effective means to fine tune the transmembrane transport in lipid vesicles.

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