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Modulation of MscL activity in droplet interface bilayers through tailored interfacial mechanical properties[1] JOSEPH NAJEM, Virginia Tech, ERIC FREEMAN, University of Georgia, SERGEI SUKHAREV, University of Maryland, DONALD LEO, University of Georgia — MscL, a large-conductance mechanosensitive channel, is an osmolyte release valve that aids bacteria in surviving hypo-osmotic shocks. The large scale of its tension-driven opening transition makes it a strong candidate to serve as a transducer in stimuli-responsive biomolecular materials. In the previous work, a V23T mutant of MscL produced a reliable activation in a droplet interface bilayer (DIB) with applied axial droplet compression. Near the maximal compression, the aqueous droplets deform and the resulting increase in surface area leads to an increase in tension in the water-lipid-oil interface. This increase in tension is the product of the relative change in the droplet surface area and the elastic modulus of the DPhPC monolayer (120 mN/m). Here, we study the interfacial properties of the droplets as a way for modulating the activity of the embedded MscL channels. This is accomplished through varying mixtures of diphytanoyl phospholipids. The results show that gating probability of MscL in DIBs increases when lipids with a higher elastic modulus are used or when cholesterol is added to the monolayer. Moreover, an intrinsic electrical bias inside the lipid membrane is created when having DPhPC lipids with higher dipole in one droplet and DOPhPC characterized with lower dipole, in the other.

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