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Effect of trodusquemine on the nanomechanical properties of biomimetic neuronal membranes on solid support

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Trodusquemine is an aminosterol which has been proposed as potential drug against neurodegenerative disorders. It exploits its protective action through a direct interaction with the cell membrane, resulting in a modulation of the physico-chemical properties of the lipid bilayer (1). Using atomic force microscopy and force spectroscopy we investigated the effect of trodusquemine on the morphological and nanomechanical properties of supported lipid bilayers (SLBs) mimicking neuronal membranes. These biomimetic SLBs exhibit a phase separation between a disordered, fluid phase and an ordered, condensed and thicker phase. The accurate measurement of the thickness of the two lipid phases allowed us to apply a recently introduced model for the calculation of the intrinsic Young's modulus of thin samples, correcting for the influence of the rigid substrate (2). We found that the membrane Young's modulus increases in the presence of trodusquemine. This increase in mechanical strength could contribute to an increased resistance of the membranes to the toxic action of misfolded protein oligomers. Moreover, the approach used in the analysis of the force spectroscopy data is shown to be very successful in eliminating artifacts in the bilayer Young's modulus arising from the presence of the solid substrate on which the lipid membrane is assembled.

1. Errico S., et al., Nanoscale 12, 22596-22614 (2020)
2. Chiodini S., et al., Small 2000269, 1-8 (2020)

Session

Molecular interactions at the membrane surface

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