Estimation of the Activation Energy of Phospholipid Membrane Fusion

(Talk #18)

Claire François-Martin*, Kévin Ho Wan, Frédéric Pincet

Physics Department, Laboratoire de Physique Statistique, Ecole Normale Supérieure, FRANCE

***Email of Presenting Author: francois-martin@lps.ens.fr**

Membrane fusion is omnipresent in living organisms. Organisms and cells are divided in different compartments, each of them has its own function but all of them need to communicate with one another. Hence, they need to fuse together as the fusion pore allows the two materials to mix or react. In vivo, fusion cannot occur spontaneously in order to maintain the integrity of the compartments. This is why this process is triggered and regulated by multiple proteins.

Biological membrane fusion is very often studied thanks to model systems like pure phospholipid bilayers. In fact, even though biological fusion is more complex and involves proteins, it is believed to follow similar pathways as the ones used by fusing phospholipid bilayers, and as the ones followed by phospholipid bilayers which are implicated in phase transition [1].

Most of the phospholipids composing the cell membrane spontaneously form stable vesicles (i.e. spherical bilayers). Thus, energy is necessary to disrupt this arrangement in order to accomplish fusion.

In this study, the goal is to quantify the activation energy necessary to trigger fusion of vesicles. We used thermal agitation to quantify the activation energy of DOPC membranes with increasing proportions of DOPE. In fact, DOPE is a very popular lipid and several studies have been done on phase transitions of DOPC-DOPE membranes. It would be interesting to compare our fusion results with the phase transition ones in order to validate the similarities between the two processes.

Reference:

[1] Yang, L., & Huang, H. W., Science, 297(5588), 1877–9 (2002)