The Incorporation of Docosahexaenoic Acid into Supported Lipid Bilayers and its Effect on Their Viscoelastic Properties; A Quartz Crystal Microbalance Study.

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Abstract

Docosahexanoic acid (DHA) is the most abundant omega-3 fatty acid in the brain. However, its interactions with different phospholipids, the degree of its incorporation into cellular membranes and the consequent effect on the membrane's physicochemical properties is still unknown. Consequently, with the use of a quartz crystal microbalance with dissipation monitoring (QCM-D) instrument, this work will discuss the DHAs affinity for different phospholipid mixtures commonly found in neuronal cell membranes. Specifically the study will establish how the presence of negatively charged phospholipids, phosphatidylinositol (PI), and phosphatidylserine (PS) in a 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC) supported lipid bilayer (SLB) formed onto a SiO2-coated QCM crystal affects DHA incorporation. The change in frequency versus change in dissipation plot (Δf vs ΔD Plot) (Figure) shows the resulting mass increase and decrease in rigidity following DHA treatment. In addition, data on the effect of calcium ions in the formation of a POPC:PS SLB and the subsequent DHA incorporation, will also be presented.

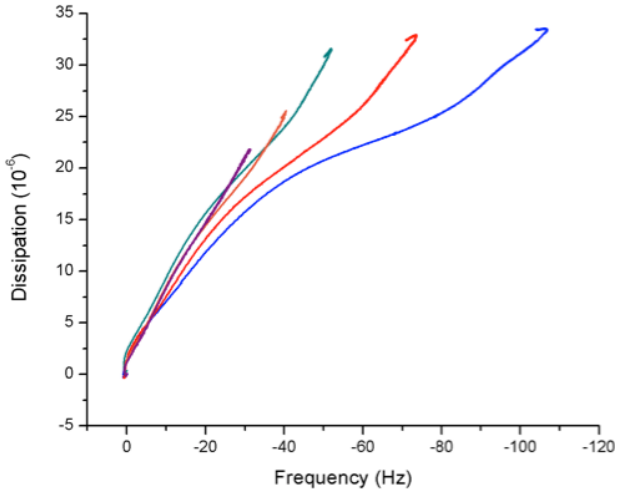

Figure. The effect of DHA on a POPC SLB. 3rd-11th harmonic Δf vs ΔD Plot. T =22°C. Harmonics 3rd —, 5th —, 7th —, 9th — and 11th —.