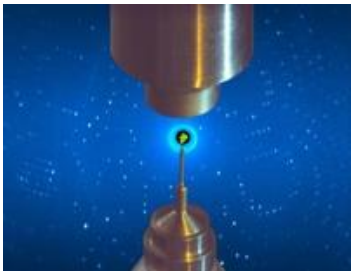

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Not just a fluidifying effect: omega-3 phospholipids induce formation of non-lamellar structures in biomembrane

Thursday, 10 June 2021 14:00 (20 minutes)

Polyunsaturated omega-3 fatty acid docosahexaenoic acid (DHA) is found in very high concentrations in a few peculiar tissues. DHA was proposed to affect the function of the cell membrane and related proteins through an indirect mechanism of action, based on the DHA-phospholipid effects on the bilayer structure. Most studies have focused on its influence on lipid-rafts, neglecting the effects on liquid disordered phases that constitute most of the cell membranes.
By combining NR, cryo-transmission electron microscopy, SANS, DLS and EPR, we characterize liquid disordered bilayers formed by the naturally 1-palmitoyl-2-oleoyl-snglycero-3 phosphocholine and different contents of a di-DHA glycero-phosphocholine, 22:6-22:6PC, from both a molecular/microscopic and supramolecular/mesoscopic viewpoint. We show that, below a threshold concentration of about 40% molar percent, incorporation of 22:6-22:6PC in the membrane increases the lipid dynamics promoting the membrane deformation. Notably, beyond this threshold, 22:6-22:6PC disfavours the formation of lamellar phases, leading to a phase separation consisting mostly of small spherical particles that coexist with a minority portion of a lipid blob with water-filled cavities. From a molecular viewpoint, the polyunsaturated acyl chains tend to fold and expose the termini to the aqueous medium. We propose that this peculiar tendency is a key feature of the DHA-phospholipids making them able to modulate the local biomembranes morphology

Primary author: PADUANO, Luigi (Department of Chemical Sciences, University of Naples "Federico II")

Co-authors: Prof. VITIELLO, Giuseppe (University of Naples, Federico II); Dr APPAVOU, Marie-Sousai (Jülich Centre for Neutron Science (JCNS) at Heinz Maier-Leibnitz Zentrum (MLZ), Forschungszentrum Jülich GmbH); FRAGNETO, Giovanna (ILL); Dr SCOPPOLA, Ernesto (Max Planck Institut fu¨r Kolloid und Grenzfla ¨chenforschung, Potsdam, Germany); Prof. D'ERRICO, Gerardo (University of Naples Federico II); Dr CLIFTON, Luke A. (ISIS Facility, Science and Technology Facilities Council, Rutherford Appleton Laboratory); RUSSO KRAUSS, irene (UNIVERSITY OF NAPLES); BARNSLEY, Lester (Jülich Centre for Neutron Science)

Presenter: PADUANO, Luigi (Department of Chemical Sciences, University of Naples "Federico II")

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