

Packing and Mobility of Hydrocarbon Chains in Phospholipid Lyotropic Liquid Crystalline Lamellar Phases and Liposomes, Characterised Using Positron Annihilation Lifetime Spectroscopy (PALS)

Aurelia W. Dong,^{1,2} Celesta Fong,² Lynne J. Waddington,³ Anita J. Hill,⁴ Ben J Boyd^{1,5} * and Calum J. Drummond^{2,6} .

¹ Drug Delivery, Disposition and Dynamics, Monash Institute of Pharmaceutical Sciences, Monash University (Parkville Campus), 381 Royal Parade, Parkville, VIC 3052, Australia

² CSIRO Manufacturing Flagship, 343 Royal Parade, Parkville, VIC 3052, Australia

³ CSIRO Manufacturing Flagship, Private Bag 33, Clayton, VIC 3169, Australia

⁴ CSIRO Manufacturing, Productivity and Services, PO Box 312, Clayton, VIC 3169, Australia

⁵ ARC Centre of Excellence in Convergent Bio-Nano Science and Technology, Monash Institute of Pharmaceutical Sciences, Monash University (Parkville Campus), 381 Royal Parade, Parkville, VIC 3052, Australia

⁶ School of Applied Sciences, College of Science Engineering and Health, GPO Box 2476, RMIT University, Melbourne, VIC 3001, Australia

Corresponding Authors: calum.drummond@rmit.edu.au; ben.boyd@monash.edu

Supplementary Information

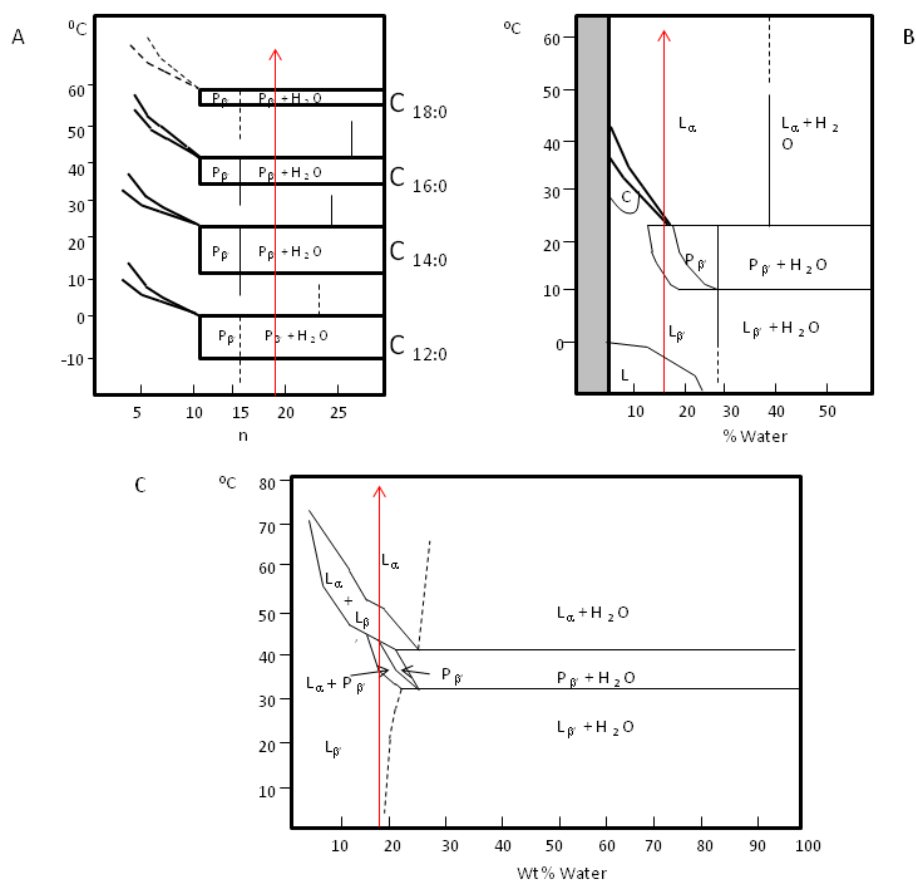


Figure S1:A) Generalised phase behaviour for phosphocholine phospholipids with lipid chain length C12-18. n represents the mol ratio of water to lipid molecules.¹ B) and C) The binary lipid-water phase diagram of bulk DMPC² and DPPC³, respectively. The red line represents the composition at which PALS measurements were made with increasing temperature.

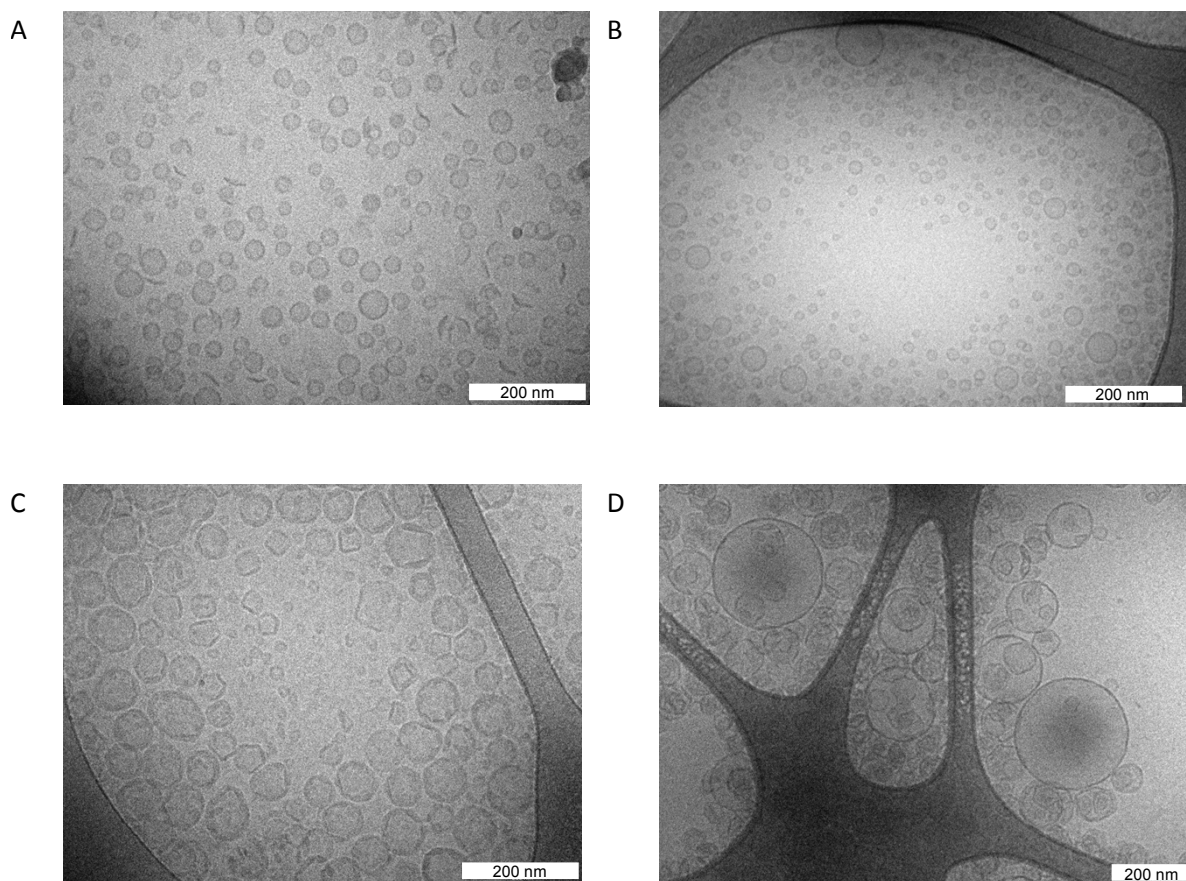


Figure S2: Cryo-TEM images of the liposome samples for A) DLPC, B) DOPC, C) DPPC and D) DSPC.

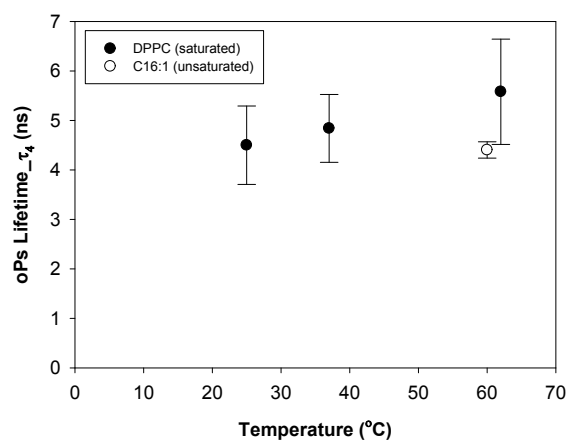


Figure S3: oPs lifetime in the organic region (τ_4) for DPPC and its corresponding unsaturated lipid (C16:1) as a function of temperature.

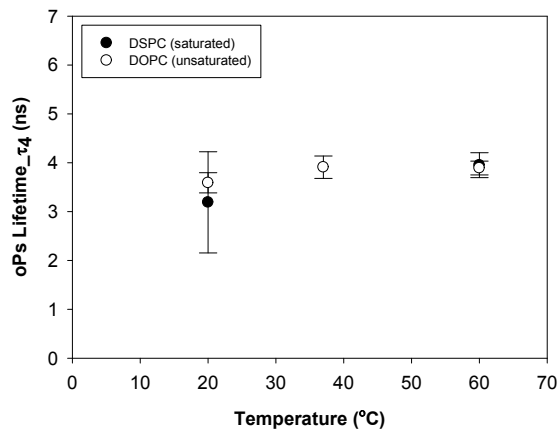


Figure S4: oPs lifetime in the organic region (τ_4) for DSPC and DOPC as a function of temperature.

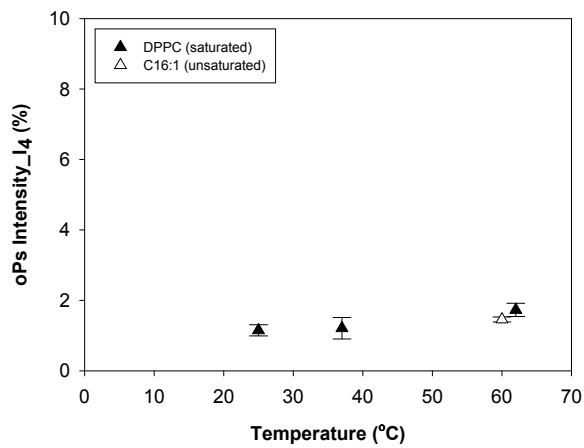


Figure S5: oPs intensity in the organic region (I_4) for DPPC and its corresponding unsaturated lipid (C16:1) as a function of temperature.

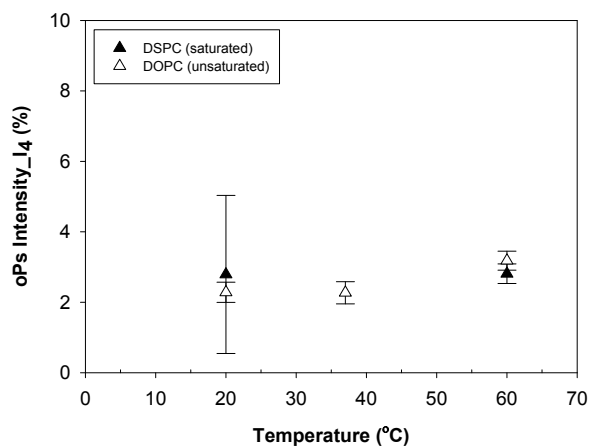


Figure S6: oPs intensity in the organic region (I_4) for DPPC and DOPC as a function of temperature.

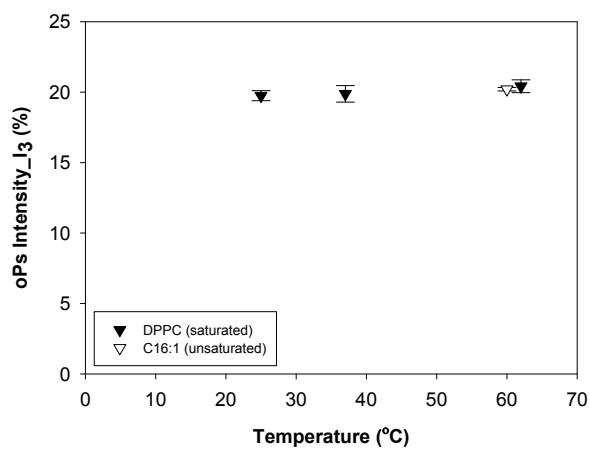


Figure S7: oPs intensity in the aqueous region (I_3) for DPPC and its corresponding unsaturated lipid (C16:1) as a function of temperature.

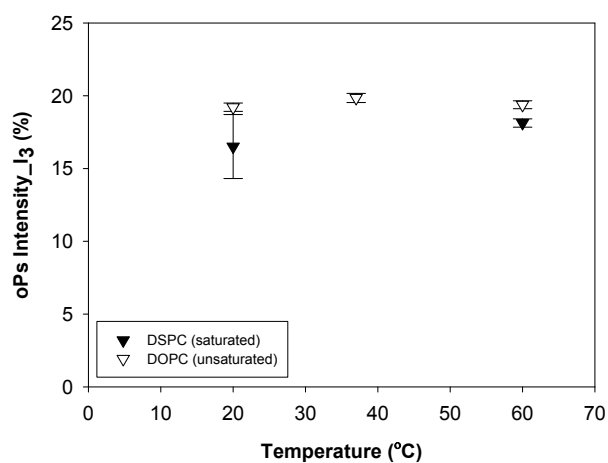


Figure S8: oPs intensity in the aqueous region (I_3) for DSPC and DOPC as a function of temperature.

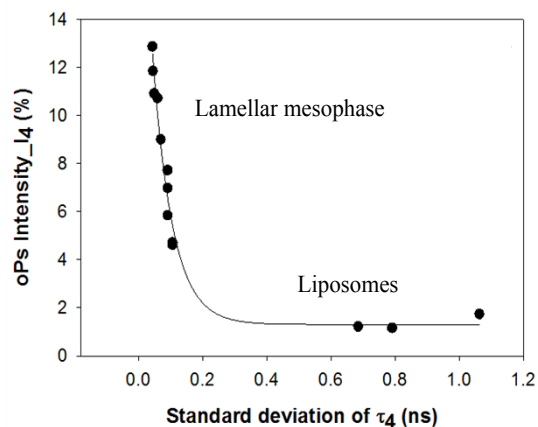


Figure S9: I_4 versus standard deviation of τ_4 for the lamellar mesophase and liposomes of DPPC. The plot shows that reducing oPs intensity values (I_4) results in increasing uncertainties for the corresponding oPs lifetime (τ_4).

References

1. M. J. Janiak, D. M. Small and G. G. Shipley, *Journal of Biological Chemistry*, 1979, **254**, 6068-6078.
2. M. Hamm and M. M. Kozlov, *European Physical Journal B*, 1998, **6**, 519-528.
3. P. M. Duesing, R. H. Templer and J. M. Seddon, *Langmuir*, 1997, **13**, 351-359.