Membrane biophysics session

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The membrane biophysics session included eight talks ranging from model membrane systems to whole cells and peptides to membrane proteins. The invited speakers were from Japan, India and Australia, and the selected presentations were primarily from early career researchers covering a range of topics in membrane biophysics. The talks were informative and exciting with stimulating discussion and audience interaction.

The opening speaker was Masahito Yamazaki from Shizuoka University, Japan. His talk, with co-authors M. Hazan and M.Z. Islam, was entitled “Single GUV studies on mode of action of antimicrobial peptides and cell-penetrating peptides”, and described how antimicrobial peptides (Sani and Separovic 2018), such as magainin 2, and cell-penetrating peptides, like transportan 10, form pores or translocate into giant unilamellar vesicles (Islam et al. 2014). His talk was followed by “Control of glycine receptor activation by glycine transporters co-expressed in *Xenopus* oocytes”, given by Diba Sheipouri, University of Sydney, and co-authored by R. Ryan and R. Vandenberg (Vandenberg et al. 2014). Their study showed how increases in co-expressed transporter density lead to diminished receptor currents, and that the actual glycine concentration sensed at the membrane by receptors can be greatly reduced due to diffusion barriers in the vicinity of the extracellular membrane.

The next talk, presented by Anton Le Brun (ANSTO, Sydney) was “Using neutron reflectometry to understand

antibiotic resistance in Gram-negative bacteria at the outer membrane”, with co-authors M. Han, S.H. Chow, H.-H. Shen, T. Velkov and J. Li. The effect of different antibiotics on model outer membranes of Gram-negative bacteria, made using lipid A with different modifications, was observed (Han et al. 2018). Then Katherine Davies from the Walter and Eliza Hall Institute of Medical Research (WEHI), Melbourne, gave a talk on “Studying the effect of membrane curvature and composition on MLKL binding and permeabilisation using model membrane systems”, which was co-authored by J. Steinkuehler, E. Hanssen, R. Dimova, E. Petrie, J. Murphy and P. Czabotar. They described how MLKL, a protein involved in necroptosis, preferentially binds to lipid disordered domains and is able to form higher order structures in model membranes (Davies et al. 2018).

The following presentation, entitled “Investigating the role of conformational change in gating and conduction of KIR K⁺ channels”, was by Katrina Black (WEHI), together with J. Gulbis, D. Miller, B. Smith, D. Laver, J. Bolla, P. Johnson, C. Robinson and A. Hill. By covalently linking adjacent subunits together, they unexpectedly found that pore-aperture limited KIR channels were able to conduct potassium readily (Clarke et al. 2010). The next speaker, Isabelle Rouiller, University of Melbourne, presented a “Study of membrane proteins by single particle cryo-electron microscopy”, which used different systems to study membrane proteins, including detergent, liposomes, nanodiscs and peptidiscs (Carlson et al. 2018).

Subsequently, Sudipta Maiti from the Tata Institute of Fundamental Research, India, gave a talk, “Ordered and disordered segments of amyloid- β drive sequential steps of the toxic pathway”, which probed the interactions of an array of A β fragments with lipid membranes and cultured neurons (Korn et al. 2018). Finally, Amani Alghalayini (University of Technology Sydney) in a paper, “Study of heat transfer from laser-irradiated gold nanoparticles using tethered bilayer lipid membranes”, co-authored with C. Cranfield, B. Cornell, Y. Guan, L. Jiang, V. Timchenko, G. Xi and S. Valenzuela, described the development of a real-time dynamic method to record the heat production due to laser irradiation of nanoparticles located directly above a bilayer membrane (Pissuwan et al. 2006).

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As the session ended, the participants went onto hear the Macaulay-Hope lecture by Mibel Aguilar (Monash University, Australia), who spoke on “Biomembrane plasticity – what, how and why of membrane structure and function” and her developments of dual polarisation interferometry techniques to allow analyses of membrane structural changes (Lee et al. 2018). Overall, this half day session brought together a range of biophysical techniques and studies which have given us significant insight into membrane structure and interactions.

Compliance with ethical standards

Conflict of interest Pingsheng Liu declares that he has no conflict of interest. Frances Separovic declares that she has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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