WESTERN SYDNEY UNIVERSITY

Nanoscale Organisation and Dynamics Group

Dynamic and Structural Heterogeneity in Red Blood Cells

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Abstract

The highly penetrative and non-ionizing nature of neutrons can provide a statistical and non-destructive probe of structure and dynamics in cellular systems in a near physiological context. Structural investigations with small angle neutron scattering (SANS)[1] and dynamic investigations using quasi-elastic neutron scattering (QENS)[2] of cell suspensions and concentrated haemoglobin solutions have enabled a reductionist understanding the crowded solution of protein inside the red blood cell. While many cellular systems can be quite complex, the red blood cell provides a simple system in which useful quantitative information can be extracted and important physical insight can be gained from neutron scattering. Using the SANS techniques we have probed the organization of the haemoglobin from the overall envelope of the globular tetramer to the organization imposed by the cell membrane around the red blood cell in actively metabolising cells. The temperature dependence of dynamics from internal motions within globular haemoglobin tetramer has been probed with QENS. The physiological implications of these observations and on-going investigations in crowded haemoglobin diffusive dynamics with PFGSE NMR are discussed.

References

1 C. Garvey, R. Knott, E. Drabarek, P. Kuchel, European Biophysics Journal With Biophysics Letters 2004, 33, 589-595; A. M. Stadler, R. Schweins, G. Zaccai, P. Lindner, Journal of Physical Chemistry Letters 2010, 1, 1805-1808.

2 A. M. Stadler, C. J. Garvey, J. P. Embs, M. M. Koza, T. Unruh, G. Artmann, G. Zaccai, Biochimica et biophysica acta 2014, 1840, 2989-2999; A. M. Stadler, C. J. Garvey, A. Bocahut, S. Sacquin-Mora, I. Digel, G. J. Schneider, F. Natali, G. M. Artmann, G. Zaccai, Journal of the Royal Society Interface 2012, 9, 2845-2855.

Profile

Chris Garvey is an instrument scientist on the SANS instrument QUOKKA, and a physicist applying advanced physical characterisations at the interface between biology and materials science. He holds senior adjunct positions in the Departments of Chemical and Materials Engineering at Monash University; School of Molecular Biosciences at the University of Sydney; and Applied Physics at RMIT University. http://www.ansto.gov.au/ResearchHub/StaffProfiles/GARVEY-CHRIS

Staff and students at all levels are welcome to attend.

Venue and Time:

2 pm Wednesday 18 May at the Campbelltown Campus in Lecture Theatre 4 (CA-09.G.02).

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