NANOSCIENCE COLLOQUIUM

Understanding Nanometer Movements in Membrane Proteins: A Magnetic Resonance Spectroscopist's View

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Abstract: Research in the Henry Wellcome Unit for Biological EPR at UEA focuses on the architecture and functional dynamics of membrane proteins, many medically relevant with a special interest on membrane transport systems and their interaction with intra-cellular signalling pathways. There is increasing evidence that membrane proteins do not act alone, but that they are organised as nano-machineries which function through the concerted action of its individual components with high precision and specificity observed in both time and space. We are seeking to unravel the principles underlying the architecture and dynamics of these protein nano-machineries as well as their function and regulation. Our experimental approach focuses on the use of advanced Magnetic Resonance techniques, specifically pulsed Electron Paramagnetic Resonance (EPR) – but also NMR techniques in combination with molecular biological and other biophysical methods including theoretical MD approaches. Our expertise lies in the development and application of novel EPR techniques to address these key questions. Here I will focus on recent method developments, which allow a shifting of the focus of this technique away from being considered purely a niche technique towards a more universal structural biological tool. I will demonstrate current state-of-the-art approaches, as well as outlining where examples of where method development is still ongoing to demonstrate the power of this technique to deliver key mechanistic insights into e.g. how to resolve multiple distance constraints in macromolecular ensembles, how to observe dynamic conformational changes at the molecular level and finally to identify the dynamic determinants of ligand binding.

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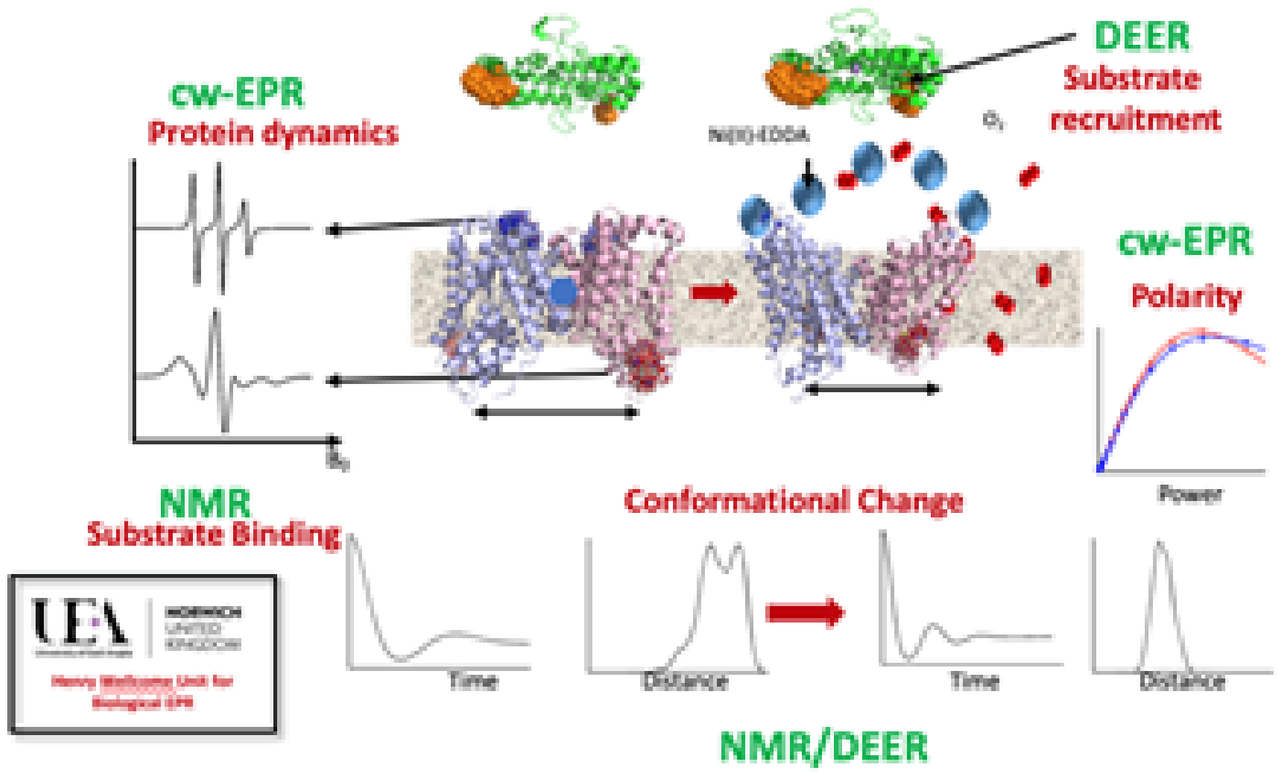

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