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Arwyn T Jones

Cardiff University, UK

Overcoming cellular barriers for drug delivery: Opening endocytic gates and pathways for intracellular targeting

Targeting a disease process inside a cell with biopharmaceuticals still represents a major challenge, not least in overcoming biological barriers such as those posed by the plasma membrane. Investment in this approach is justified when one considers the number individual intracellular targets now available to us as we continue to understand disease processes at the gene and protein level. This is true for many high-burden diseases including cancer, infectious diseases and inherited genetic defects such as cystic fibrosis. Our research is focused on studying endocytosis and specifically on designing methods to analyse individual endocytic pathways to characterise how drug delivery vectors and associated therapeutics gain access to cells. As vectors, we have paid particular attention to natural ligands, cell penetrating peptides and antibodies, focusing on their capacity to not only interact with, and enter cells, but then on monitoring their intracellular traffic to reach a final destination. In this lecture, I will describe work which we have performed focusing on design and characterization of methods to study endocytosis of drug delivery vectors and on recent studies showing how internalisation of plasma membrane receptors can be significantly enhanced, and their normal endocytic routes modified to reach a desired intracellular location. Our involvement in a €30M FP7 Innovative Medicine Initiative (IMI-EFPIA) consortium (COMPACT www.compact-research.org/) will also be discussed. This represents a public-private collaboration between 14 European academic institutes and pharmaceutical companies aiming to improve the cellular delivery of biopharmaceuticals across major biological barriers of the intestine, lung, blood brain barrier and skin.

Biography

Arwyn T Jones completed his PhD in Protein Biochemistry and Crystallography at Birkbeck College, University of London. Then, he undertook Post-doctoral position investigating Endocytosis at University of Liverpool and Harvard University, Boston USA. In 2000, he was awarded a European Molecular Biology Organization fellowship to work at European Molecular Biology Laboratory (EMBL), Heidelberg Germany, and continued at EMBL when he was awarded an Alexander von Humboldt Foundation scholarship. He was appointed as Lecturer at Cardiff School of Pharmacy and Pharmaceutical Sciences, Cardiff University in 2002 where he is now a Professor in Membrane Traffic and Drug Delivery.

JonesAT@cardiff.ac.uk

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