Nanotechnology, synthetic biology and lipids — biological membrane as a tool and therapeutic target

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Abstract

Lipids are key structural components of biological membranes. In addition, they are indispensable for a wide range of cellular functions, including signalling and selective transport. In our study we employ various membrane model systems, including lipid monolayers, bilayers and vesicles of different size together with state-of-the-art biophysical, biochemical and cellular approaches to study lipid bilayers both as a biological structure and as a template to design synthetic systems. As there is an urgent necessity for developing drug carriers that enable delivery of active compounds with increased efficacy and reduced toxicity when comparing to conventional formulations we focused on nanostructures based on lipids and specific ligands. Obtained nanocarriers proved that bringing into life the idea of merging several approaches, which were already described as the most promising in drug carrier design (e.g. nucleic acid complexation, liposomes with PEGylated lipids, targeted delivery), to introduce a new platform for efficient and nontoxic delivery of various active substances could be one of the most promising approaches for designing new therapies.

About the presenter

Dr hab. Aleksander Czogalla is a graduate of the University of Wrocław, currently head of Department of Cytobiochemistry at the Faculty of Biotechnology of the University of Wrocław. For several years he worked scientifically in pharmaceutical companies (including Hasco-Lek, Novasome, LipoTech, Lipid Systems), as well as at universities in Germany. Major research focus on biophysics and biochemistry of biological membranes, synthetic biology and liposomal drug carriers. Several times awarded by the Rector of the University of Wrocław for scientific achievements. In 2015, he was awarded the Iuvenes Wratislaviae Award of the Polish Academy of Sciences for outstanding work entitled *Innovative DNA origami structures as a tool for studying processes occurring on the surface of biological membranes*. In 2016, he was among the finalists of the Polityka Scientific Award. He is one of the faces of the Generation W campaign promoting Wrocław.