Targeted drug delivery systems — Part II: The case of vitamin C

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Abstract

The development of the dedicated delivery system for a specific biologically active substance requires a thorough analysis of the compound metabolism, its molecular level interactions with biological structures as well as its distribution within the human body. Only then the strategy for the effective delivery system can be proposed. To achieve effective delivery, a dedicated nano-device needs to be designed, produced, and tested. The intellectual effort leading to the development of the targeted delivery system is demonstrated using the example of liposomal vitamin C. The development process starts at an in-depth analysis of the vitamin C functions in the human body and establishment of the correlation between physico-chemical properties on its fate in vivo. I will present and discuss the effect of vitamin C status in the human body on its clinical state. Based on medical, physiological, and molecular biology data, in combination with recent observations regarding vitamin C capability to cross biological membranes, a comprehensive quantitative model has been constructed and used to propose the quantitative regime of vitamin C supplementation during chemotherapy.

About the presenter

Prof. Marek Langner is a biophysicist, Director of the Research and Science Dept. at Lipid Systems, and a co-founder of the company. He is also professor at Wrocław University of Science and Technology, Dept. of Biomedical Engineering. Prof. Langner obtained his PhD at Wrocław Medical University in 1985 and his habilitation at University of Łódź in 1999. In 2011, he was awarded the title of professor, on request of the Department of Biotechnology and Biophysics at Jagiellonian University. After obtaining his PhD, he worked at State University of New York at Stony brook, Roswell Park Cancer Institute, Buffalo, NY, and Wrocław Agricultural University. Since 1999 he has been affiliated with the Wrocław University of Sciences and Technology, where he is head of the Laboratory for Biophysics of Macromolecular Aggregates. His scientific interests are focused on the biophysics of multicomponent systems and their interactions with biological matter. His basic research, presented in over 100 publications, has been translated into practice. His extensive experience with lipid aggregates has been used for the development of pharmacologically viable targeted drug delivery systems. He was a co-founder of the spin-off company Novasome in 2004 and later in 2009 of the start-up company Lipid Systems, which is currently developing liposomal formulations of a variety of biologically active compounds.