KEYNOTE FORUM | **DAY 2** *JOURNAL OF NANOMEDICINE & NANOTECHNOLOGY 2019, VOLUME 10 | DOI: 10.4172/2157-7439-C1-099*

Pharmaceutical nanotechnology in preparing "smart" combination preparations of RNA and chemotherapeutic drugs for multidrug-resistant cancer

Tumor therapy, especially in the case of multidrug-resistant cancers, could be significantly enhanced by using siRNA down-regulating the production of proteins, which are involved in cancer cell resistance, such as Pgp or survivin. The even better response could be achieved is such siRNA could be delivered to tumors together with a chemotherapeutic agent. This task is complicated by the low stability of siRNA in the biological surrounding. Thus, the delivery system should simultaneously protect siRNA from degradation. We have developed several types of lipid-core polymeric micelles based on PEG-phospholipid or PEI-phospholipid conjugates, which are biologically inert, demonstrate prolonged circulation in the blood and can firmly bind non-modified or reversibly-modified siRNA. Additionally, these nano-preparations can be loaded into their lipidic core with poorly water-soluble chemotherapeutic agents, such as paclitaxel or camptothecin. In experiments with cancer cell monolayers, cancer cell 3D spheroids, and in animals with implanted tumors, it was shown that such co-loaded preparations can significantly down-regulate target proteins in cancer cells, enhance drug activity, and reverse multidrug resistance. In order to specifically unload such nano-preparations inside tumors, we made them sensitive to local tumor-specific stimuli, such as lowered pH, hypoxia or overexpressed certain enzymes, such as matrix metalloproteases. Using pH-, hypoxia-, or MMP2-sensitive bonds between different components of nano-preparations co-loaded with siRNA and drugs, we were able to make the systems specifically delivering biologically active agents in tumors, which resulted in significantly improved therapeutic response.

Biography

Vladimir P Torchilin, Ph.D., D.Sc. is a University Distinguished Professor of Pharmaceutical Sciences and Director, Center for Pharmaceutical Biotechnology and Nanomedicine, Northeastern University, Boston. His interests include drug delivery and targeting, nanomedicine, multifunctional and stimuli-sensitive pharmaceutical nanocarriers, biomedical polymers, experimental cancer therapy. He has published more than 400 original papers, more than 150 reviews and book chapters, wrote and edited 12 books, and holds more than 40 patents. Google Scholar shows more than 60,000 citations of his papers with H-index of 107. He is Editor-in-Chief of Current Drug Discovery Technologies, Drug Delivery, and OpenNano, Co-Editor of Current Pharmaceutical Biotechnology and on the Editorial Boards of many other journals. He received more than $30 M from the governmental and industrial sources in research funding. He has multiple honors and awards and in 2011, Times Higher Education ranked him number 2 among top world scientists in pharmacology for the period of 2000-2010

Vladimir P Torchilin
Northeastern University, USA

v.torchilin@northeastern.edu