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Liposomes targeted with therapeutic antibodies: A potent tool in anticancer therapy

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Statement of the Problem: Nanoparticle-based drug formulations are expected to be more efficient and less toxic than conventional drug formulations. This is indeed true in case of the most widely used nanoparticles including liposomes, micelles, dendrim¬ers, nanotubes, and polymers. Moreover, most of the nanoparticle-based drug formulations offer a possibility of targeting the drug-loaded vehicles. Such strategy in case of anticancer drugs promises to be a hopeful strategy that allows reducing toxicity and minimizing adverse side effects. Targeting exploits the high affinity of cell-surface-targeted ligands, for specific retention and uptake by the targeted diseased cells.

Methodology & Theoretical Orientation: In this short review, we would like to point to the application of liposomes as a versatile anticancer therapeutic carrier which can be targeted with antibodies directed against specific surface markers of cancer cells. Long-circulating liposomes containing PEG-PE and chemically activated PEG (e.g. maleimide derivative) may be considered as "Lego blocks". Combining them with other components (i.e. drugs and surface-exposed molecules) in different configurations opens up multiple possibilities for different formulations of targeted anticancer drugs. They can be directed to specific tumor cells via targeting ligand(s) which could be attached covalently to the surface of liposomes. Prominent and relatively easy to apply as targeting agents are therapeutic antibodies and are already available on the market. Such liposomes may contain actively or passively encapsulated therapeutics of various natures.

Conclusion & Significance: Two types of such nanocarriers were developed in our laboratory. One consists of *BCL-2* antisense oligodeoxynucleotide complexed with cationic lipid or polyethyleneimine with anti CD20 antibody and the other is based on simvastatin carrying liposomes targeted with anti HER2 antibody. The former type of formulations fulfill criteria of size, stability, specificity and high efficacy against specific type of cancer cells without obvious side effects in both *in vitro* and *in vivo* studies. Liposomal formulation of simvastatin targeted with HER2 antibody proves promising vehicle to deliver relatively high amounts of simvastatin to HER2 overexpressing cells.

Biography

Aleksander F Sikorski is a Professor in Biochemistry and Cell Biology at the Faculty of Biotechnology, University of Wrocław. His major scientific interests are membrane biochemistry, in particular, structure and function and biological role of spectrins as well as in lateral organization of biological membranes. His long lasting interest is in application of liposomes as drug carriers. He has been an author and co-author of more than 130 scientific papers (great majority published in peer-reviewed journals) and supervised 24 PhD students who successfully obtained their degrees. He is one of founding Editors, and since 2016 Editor-in-Chief of the international journal, *Cellular and Molecular Biology Letters* (Established in 1996, i.f. 1.7) which is now published in collaboration with BMC/SpringerNature. He has been a Team Leader for about 25 years and a Chair of the Department of Cytobiochemistry since 2001. He was a founding Head of Academic Center for Biotechnology of Lipid Aggregates for 8 years (2002-2010).

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