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Magnetotherapy in support of targeted anti-cancer therapies based on the application of magnetoliposomes as nanocarriers of anti-cancer drugs

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Studies on new drug nanocarriers combining both targeting strategy and controlled release of the compound are highly innovative and fast developed. A promising example of such systems are magnetoliposomes, which are the combination of liposomes and superparamagnetic iron oxide nanoparticles embedded in their lipid bilayer. In this structure, the drug is encapsulated into the aqueous phase of the liposome. High magnetization of nanoparticles allows them to be used as vectors targeting the nanocarrier only to its site of action using an external magnetic field. In addition, the application of the low-frequency alternating magnetic field enables to controlled release of the loaded drug due to vibrations of nanoparticles in the bilayer and mechanical degradation of the carrier. Obtaining the above characteristics of the carrier allows effectively increasing the selectivity of the drug towards cancer, thus improving its therapeutic index. The aim of the research is to develop a drug delivery and controlled release system supported by a magnetic field. Planned synthesis procedures (co-precipitation method and thin phospholipid film hydration technique) allow to obtain magnetoliposomes and their in vitro controlled drug release capacity was determined by fluorescence measurements. The cytotoxic activity of magnetoliposomes containing doxorubicin against normal and cancerous human breast cell lines was evaluated by measuring the cells' viability after their incubation in magnetic field. This work provides the principal knowledge regarding toxicity and potential biomedical application of doxorubicin-loaded magnetoliposomes, aiming at alleviation of the side-effects of the drug and focusing the cytostatic therapy only on the tumor tissue.

Biography

Edyta Maroń began interdisciplinary PhD studies TRI-BIO-CHEM in 2018 at the Faculty of Chemistry of the Warsaw University of Technology and the University of Warsaw. She carries out her research work at the Chair of Medical Biotechnology. Her academic achievements include one published article and one article in a review, as well as several conference presentations. Work implemented as a part of Operational Project Knowledge Education Development 2014-2020 cofinanced by European Social Fund.