PHARMACOKINETICS OF QUANTUM DOTS IN DIFFERENT TYPES OF BREAST CANCER CELLS

DAPKUTE Dominyka, STEPONKIENE Simona, ROTOMSKIS Ricardas

National Cancer Institute, Vilnius University, Vilnius, Lithuania, EU

Abstract

It was noticed that cancerous tissue possesses cellular hierarchy similar to the one found in a healthy tissue and a small subpopulation of cancer cells, called cancer stem cells, was identified. It is thought that these aggressive cells are responsible for the initiation and maintenance of tumour and resistance to conventional cancer therapy.Semiconductor fluorescent nanoparticles called quantum dots (QDs) are brighter and more photostable than organic dyes and can be used as a platform for the delivery of biologically active molecules to the tumorigenic cells. Therefore, QDs can possibly combine diagnostics and therapeutics. However, knowledge about their accumulation, distribution and elimination in different types of cancer cells is still limited. To determine the pharmacokinetics of QDs we used two different breast cancer cell lines MDA-MB-231 and MCF-7. Immunophenotyping revealed that MDA-MB-231 cells can be used as a model of cancer stem cells. Flow cytometric analysis and spectroscopy showed the quantitative accumulation and elimination kinetics of the QDs in cancer stem cells and cancer non-stem cells. Distribution studies by confocal microscopy revealed that during early incubation periods QDs attach to the cell membrane, after 30-60 minutes they are endocytosed and vesicles containing QDs are formed in the perinuclear region. Colocalization studies demonstrated that these vesicles with QDs are early endosomes and after 24 hours they change to late endosomes and lysosomes.

Keywords: Quantum Dots, Pharmacokinetics, Cancer Stem Cells, Flow Cytometry, Confocal Microscopy, Colocalization

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