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Nanomedicine-based drug delivery systems for anti-cancer targeting and treatment.

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Over the last several decades, there has been tremendous amount of interest in developing novel nanoparticles for drug delivery to cancers. These nanoparticle platforms can be categorized as organic-based (e.g., lipid nanoparticles, biodegradable polymeric nanoparticles, and viral vectors), inorganic-based (e.g., metallic nanostructures, silica nanopartices, and quantum dots), or a hybrid combination of the aforementioned.
The Nano Delivery System Laboratory group of National Nanotechnology Centre has been focusing on the use of nanotechnology for targeted delivery and controlled release of drugs, and biopharmaceuticals, in order to improve their effectiveness for the prevention and treatment of human diseases. Our group has generated a number of nanocarrier platforms and demonstrated their potential for cancer treatment. For example, we investigated the application of modified chitosan biopolymer as a potential vector for suicide gene delivery to cancers related to the reproductive system. We also engineered the bacteriophage-based nanocarrier (derived from a virus of bacteria and non-pathogenic for humans) that has promise in cancer gene therapy. Moreover, our group has reported a number of improved versions of lipid-based nanocarriers such as phospholipid-chitosan nanoliposomes, antibody-directed lipid nanoparticle platforms and mucoadhesive nanostructure lipid carrier (NLC), all of which have great potential for the delivery anti-cancer drug to various types of cancers.
Importantly, numerous nanoparticle platforms are being investigated and therefore require preclinical in vitro studies that accurately represent physiological conditions. In addition to conventional cell culture models, we have developed three dimensional (3D) tumour spheroid models as well as a flow chamber system and evaluated the possibility of using these system as a valuable device to examine efficiency of nanocarrier-mediated anticancer drug delivery and targeting specificity before moving on to animal studies.
This talk covers our current research as well as our previously reported nanocarrier platforms, their conceptual design and development, and the success of these platforms that present a breakthrough in the delivery of anti-cancer agents. This talk will also summarize the established models for in vitro therapeutic screening that have potential to provide reliable information superior to conventional cell culture to improve and optimize drug delivery systems for an effective cancer targeting.

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