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Multifunctional nano- and micro- theranostic platforms for cancer treatment

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Recent advances in nanotechnologies have generated revolutionary impact on modern drug delivery and cancer treatment. Due to the complexity of cancers, multifunctional drug delivery platform that combines the advanced properties of different materials for combinatory treatment are highly demanded. However, these platforms are difficult to be built-up because the materials and therapeutic agents often have diverse properties.

Herein, I will report the progress we have made in designing and fabrication of multifunctional nano- and micro-drug delivery systems (DDSs). For the micro-DDSs, the microfluidic emulsion droplet technique was employed to fabricate microparticle platforms containing DNA structures for gene delivery, gold nanorods for photothermal treatment, and magnetic nanoparticles for imaging. For nanoparticle platforms, multiple chemotherapeutics such as doxorubicin and cisplatin were encapsulated in liposome/gold nano-shells. DNA aptamers were attached to the nanoshell surfaces to stabilize the particles and target the cancer cells. These platforms were tested in cellular models to demonstrate their efficacy in targeted drug delivery, photothermal release, and radiation enhancement.

Biography:

As Research Chair in Applied Nanotechnology in Verschuren Centre at Cape Breton University, Dr. Shine (Xu) Zhang developing and applying nanotechnology to address the emerging healthand environmental issues. His research focuses on interfacing biomolecules to various nanostructured materials for cancer diagnostics and treatment. Dr. Zhang graduated from the University of Waterloo with a PhD degree in Chemistry. He finished his postdoctoral training in nanotechnology at Waterloo Institute for Nanotechnology and the School of Engineering and Applied Science at Harvard University.