Radiation -induced reactive oxygen species from designed nanomaterials for cancer treatment

Ewa M. Goldys, University of New South Wales, Australia
e.goldys@unsw.edu.au
Sandhya Clement, University of New South Wales, Australia
Anna Guller, University of New South Wales, Australia
Guozhen Liu, University of New South Wales, Australia
Jared Campbell, University of New South Wales, Australia
Wei Deng, University of New South Wales, Australia
Brian C Wilson, University of Toronto/University Health Network, Ontario, Canada

Designed nanomaterials that produce reactive oxygen species upon exposure to radiationffer promise of a novel cancer treatment strategy, Similar to photodynamic therapy (PDT) but suitable for deep tumours, the new approach called X-PDT is highly effective at clinically low radiation doses. The X-PDT agents can enhance cancer radiotehrapy, by increasing its selectivity and decreasing side effects. Additionally, the nanomaterial platform offers therapeutically valuable functionalities such as molecular targeting, the capability for drug/gene delivery, adaptive responses and more. We explore the options for optimisation and clinical translation of these materials. We explain the underpinning mechanisms which make it possible to create X-PDT agents with sophisticated functionalities. Finally we discuss the roadmap for designing such nanomaterial with optimised performance.

About the speaker

Professor Ewa M. Goldys is Deputy Director of the Australian Research Council Centre of Excellence in Nanoscale Biophotonics (cnbp.org.au) and she is SHARP Professor at the Graduate School of Biomedical Engineering at the University of New South Wales, Sydney, Australia. She is Fellow of the Optical Society, SPIE (International Society for Optics and Photonics), Australian Academy of Technology Science and Engineering (ATSE) and winner of the 2016 Australian Museum Eureka Prize for 'Innovative Use of Technology'.

Her research spans the interface of ultrasensitive optical characterization, biotechnology, materials science and photonics. A portfolio of her works is centred on the development and understanding of luminescence emission in doped nanocrystals where she developed advanced methods of synthesis and characterisation of fluorescent nanoparticles for applications in fluorescence labelling. Her expertise in ultrasensitive optical characterisation and nanotechnology led to the development of novel approaches to biochemical and medical sensing and diagnostics. Current projects focus on label-free non-invasive high content cellular imaging and characterisation of cell subpopulations, on nanoparticle chemical sensors and theranostics.