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Catalytic cancer therapy by converging biosystem and nanoparticles

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ABSTRACT

Nanoparticle-based catalysts have been developed for catalytic nanomedicine to generate therapeutic compounds locally towards safe and effective treatment of diseases. In this talk, I will present our recent work on development of bioresponsive nanoparticles for chemodynamic, photodynamic and sonodynamic therapy by leveraging the internal or external stimuli-triggered catalytic reactions. Our nanoparticle-based catalysts have demonstrated high catalytic activity to in-situ generate reactive oxygen species efficiently to induce apoptosis of tumor cells.[1] The nanoparticles exhibited highly selectivity to the tumor microenvironment. The hydroxyl radical generation-induced therapeutic effect was further enhanced by sonocatalysis and cascade catalytic reactions triggered by photocatalysis.[2-4] We have also shown that the nanoparticles generated oxygen bubbles and promoted the long-distance and directional movement, thus achieving target homing and deep penetration of the nanomedicine.[5]

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KEY WORDS

Nanomedicine, catalysis, nanoparticles, cells, bacteria

BIOGRAPHY

Zi (Sophia) Gu is an Associate Professor at the School of Chemical Engineering, University of New South Wales (UNSW Sydney). She leads a NanoBiotechnology Research Group at UNSW. She is Chief Investigator of Australian Centre of Excellence for Carbon Science & Innovation and a member of Australian Centre for NanoMedicine and UNSW RNA Institute. After her PhD training at the University of Queensland and Cornell University, she was awarded with Australian NHMRC Peter Doherty Biomedical Fellowship and joined UNSW in 2016. Her research focuses on developing advanced nanomaterials and delivery strategies to address critical issues in health and medicine. To date, she has published over 90 journal papers in the areas of nanomaterials and nanomedicine. Her research has been supported by ARC, NHMRC, NSW Health, National Heart Foundation, Tour de Cure etc. She serves as Editor-in-Chief of Cancer Nanotechnology and editorial member of several journals of Wiley and Springer Nature.

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