CBC SEMINAR ANNOUNCEMENT

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Chlorin–Polyoxometalate and Chlorin–Gold Nanorod Complexes for Efficient Photosensitization

Photodynamic therapy (PDT) is a promising non-invasive cancer treatment based on activation of photosensitizer (PS) upon light irradiation for a generation of reactive oxygen species (e.g. singlet oxygen, 1O2) to destroy the tumors.[1] The development of desirable PS as well as delivery systems of PS (e.g. gold nanoparticles (GNPs), gold nanorod (GNR) and polyoxometalate (POM)) has attracted much attention for highly selective targeting of tumor sites.[2]

Recently, we have developed water soluble ionic liquid type PSs and GNPs, in which the GNPs used as a drug delivery vehicle reveals significantly enhanced PDT activity compared with the free PSs.[3]

We prepared 4:1 supramolecular complexed ionic salt between pyridinium chlorin and polyanionic [α-SiMo12O40]4– exhibits significantly enhanced photodynamic activity against A549 cell lines because of increased singlet oxygen photogeneration through high cellular penetration and localization of the chlorin molecules on the ionic salt into the cancer cell (Fig1a).[4] Confocal laser scanning microscopy images clearly represent a higher uptake and photodynamic effect of this supramolecular complex corresponding to the lower IC50 value compared to the free chlorin.

In addition, GNR–PS complex was prepared using anionic PS (sodium salt of purpurin-18) and cationic poly(allylamine hydrochloride) by layer-by-layer method, and was characterized by transmission electron microscopy, UV-vis spectroscopy, and zeta potential (Fig1b).[5] The GNR–PS complex is a promising agent for a synergistic (photothermal and photodynamic) therapy (PTT/PDT), in which PTT generates heat as well as operates the PS release which maximize the following PDT activity. The combined dual therapy, PTT followed by PDT, exhibits a significantly higher photocytotoxicity result based on synergistic effect of hyperthermia from PTT as well as singlet oxygen photogeneration from PDT.

Fig1. (a) Synthesis of chlorin–POM complex for PDT, and (b) Preparation process of GNR–PS complex by layer-by-layer method for a combination therapy (PTT followed by PDT).


Date: 10th May 2016 (Tuesday)
Time: 11:00am – 12:30pm
Venue: NTU SPMS CBC Building Level 2, Conference Room
Host: Assoc Professor Zhao Yanli

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