REGIONAL CENTRE FOR BIOTECHNOLOGY
Journal Club

Prodrugs Forming High Drug Loading Multifunctional Nanocapsules for Intracellular Cancer Drug Delivery.

Youqing Shen et al.(2010) J. AM. CHEM. SOC.,132, 4259–4265.

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Wednesday, January 2, 2013
4:00 pm
Seminar Room

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Anticancer drugs embedded in or conjugated with inert nanocarriers, referred to as nanomedicines, show many therapeutic advantages over free drugs, but the inert carrier materials are the major component (generally more than 90%) in nanomedicines, causing low drug loading contents and thus excessive uses of parenteral excipients. Herein, we demonstrate a new concept directly using drug molecules to fabricate nanocarriers in order to minimize use of inert materials, substantially increase the drug loading content, and suppress premature burst release. Taking advantage of the strong hydrophobicity of the anticancer drug camptothecin (CPT), one or two CPT molecule(s) were conjugated to a very short oligomer chain of ethylene glycol (OEG), forming amphiphilic phospholipid-mimicking prodrugs, OEG-CPT or OEG-DiCPT. The prodrugs formed stable liposome-like nanocapsules with a CPT loading content as high as 40 or 58 wt % with no burst release in aqueous solution. OEG-DiCPT released CPT once inside cells, which showed high in vitro and in vivo antitumor activity. Meanwhile, the resulting nanocapsules can be loaded with a water-soluble drugsdoxorubicin salt (DOX· HCl)swith a high loading efficiency. The DOX· HCl-loaded nanocapsules simultaneously delivered two anticancer drugs, leading to a synergetic cytotoxicity to cancer cells. The concept directly using drugs as part of a carrier is applicable to fabricating other highly efficient nanocarriers with a substantially reduced use of inert carrier materials and increased drug loading content without premature burst release.