Drug delivery by liponanocapsules : a new nanomedicine concept

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NANYANG TECHNOLOGICAL UNIVERSITY

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Undergraduate Research Experience on CAmpus

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DRUG DELIVERY BY LIPOSOMES: A NEW NANOMEDICINE CONCEPT

introduction

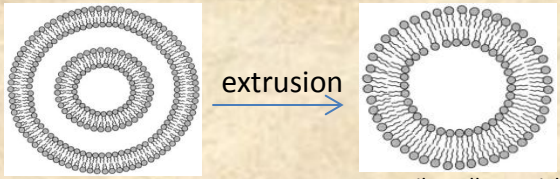
Liposomes are spherical lipid bilayer vesicles with aqueous cores consisting of phospholipids, which have the ability to entrap hydrophilic and hydrophobic drugs in internal cores and bilayers. As drug carriers, liposomes posses several advantages: high biocompatibility and biodegradability, nontoxic, nonimmunogenic, protect of drug from enzyme.

This research is to study the loading and controlled release of hydrophilic drug (Timolol Maleate) in different liposomes.

objectives

The main objective is to be able to formulate liposomal systems that can achieve long term drug release. In addition, the released drug concentration must be within the therapeutic level to prevent over-dosing or under-dosing. Over-dosing can lead to adverse toxicity effects, while under-dosing renders the drug ineffective. It also ensures better patient compliance and reduces the toxic side effects of prolong drug usage.

method



Multilamellar vesicle (MLV)

Large unilamellar vesicle (LUV)

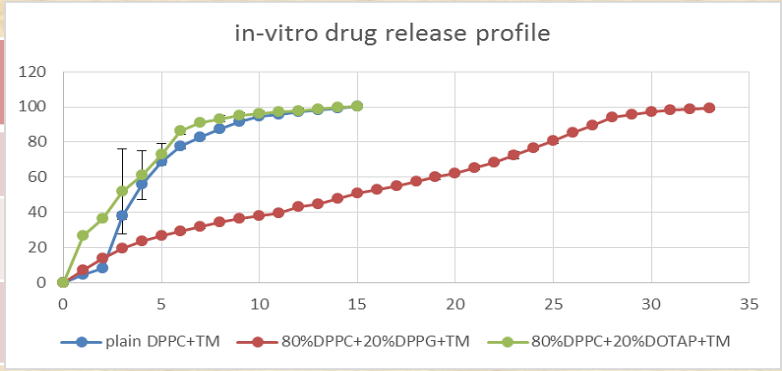
LUV has better resistance to fusion and the ability to entrap larger volumes of drug.

procedures

Formulation and extrusion of liposomes → Set up pH gradient (dialysis) → Active loading (weak acid loading method) → Characterization of loaded liposomes → In-vitro drug release experiments

sample results

(in nm)	Z-average size(before)	Z-average size(after)
Plain DPPC	101.9	109.1(5 weeks)
80%DPPC+ 20%DPPG	102.3	141.5(10 weeks)
80%DPPC+ 20%DOTAP	108.8	135.5(5 weeks)



The profile shows that DPPC+DPPG(negatively charged) has a most prolonged release profile and reasonable size stability on storage, which meets the objective. However, by comparing the z-average size change, plain DPPC shows a better resistance to fusion, which means it has a better stability during storage but release was not sustained.

future work

Liponanocapsules are fabricated by deposition of alternating layers of positively charged and negatively charged polyelectrolytes onto charged liposomal templates, using layer-by-layer coating method. Next part of the research is to prepare liponanocapsules as drug carriers and study its loading and release behaviors.

Project Title: Drug Delivery by Liponanocapsules: A New Nanomedicine Concept

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