以微脂粒包覆光感物質之光動力效應探討

Investigation of the Photodynamic Effect for Liposome-Encapsulated Photosensitizers

中文摘要

光動力治療的構成要素爲光感物質和特定波長的光，其治療效果主要取決於累積在作用部位的光感物質及有效光照劑量，而副作用則爲光毒性傷害。因此如能將光感物質侷限在作用部位，不僅可降低副作用，還有提高藥物濃度和減低劑量的優點。本研究目的即是開發以微脂粒作爲光感藥物的輸送載體，以包覆模式藥 Hematporphyrin (Hp) 和 Rose bengal (RB)，探討脂質和不同比例光感物質對微脂粒粒徑，包覆率及穩定性之影響， 並以肺腺癌細胞 (CL1-5) 比較與未經包覆者在細胞內的螢光累積量、以及經由發光二極體 (LED) 引發光動力效應後之細胞毒性 。

由實驗結果得知，所製備出之微脂粒包覆光感物質平均粒徑約 80 nm，Hp 和 RB 的最高包覆量分別爲 59 ± 6 mg/mmole 及 103 ± 7 mg/mmole，而最高包覆率則爲 71% 及 88%。藉由微脂粒穩定性分析；在 4˚C 環境下儲存一個月，微脂粒之 Hp 和 RB 的漏損率 (leakage %) 分別爲 18 ± 10 % 及 4.5 ± 2%。儲存三個月平均粒徑和粒徑分佈並無明顯變化，代表在儲存時間以內，微脂粒並無聚集或融合的現象發生。細胞實驗結果顯示，微脂粒包覆組之細胞內的螢光強度皆高於未包覆組，然而在光動力效應所得到之結果，以微脂粒作爲光感物質載體無法有效提升光動力效應。

英文摘要

Photodynamic therapy (PDT) requires the presence of a photosensitizer and light of a specific wavelength. Enhancement of PDT efficiency can be achieved through modifications on the photosensitizer. In this study, we would like to develop liposomes as the carrier systems for photosensitizers. Hematoporphyrin (Hp) and Rose Bengal (RB) were used in this study as the model photosensitizers, and a Light-Emitting Diode (LED) array device was used as the light source. The effects of liposomal lipid composition and photosensitizer to lipid ratio on the entrapment parameters were studied. PDT efficiencies of the free form photosensitizers and liposomal-photosensitizers were compared in cultured CL1-5 cells. Our data showed the entrapment was about 59 ± 6 mg/mmole for Hp and 103 ± 7 mg/mmole for RB and highest efficiency was about 71% for Hp and 88% for RB. The average size was about 80 nm in diameter . Stability tests for liposomal-photosensitizers showed that the average size and distribution remained almost constant when stored at 4℃ up to 3 months. About 70% of the entrapped Hp and 95% of the entrapped RB remained in

the liposomes up to 1 moth. The cell culture results revealed that the fluorescence intensity generated by incubation with the liposomal-photosensitizers was significantly higher than that with free form. However, the PDT effect did not appear to directly correlate with the fluorescence results. The dose of the photosensitizer and that of the light seemed to have great influence on the PDT performance of the liposomal encapsulated samples.