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Hyperbranched copolymer micelles enhances doxorubicin - induced cytotoxicity in breast cancer cells

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Abstract: In this study, we synthesized and characterized Bis-MPA based amphiphilic hyperbranched nanoparticles. As drug carrier, these dendrimers are considered to be very promising due to their low toxicity, biodegradable structure, and non-immunogenic properties. Doxorubicin (DOX) was successfully encapsulated in the hyperbranched carriers, and the drug release assay of drug-loaded NPs exhibited sustained release of drug. The *in vitro* cytotoxicity assay of the drug-loaded NPs showed that DOX-H30-PEG10k NPs improved the antiproliferative efficacy over native DOX. In addition, the formulation could be efficiently absorbed by cancer cells and induce apoptosis.

Introduction

Chemotherapy is commonly required for the treatment of localized and metastatic breast cancer. However, the use of chemotherapeutic drug is limited by its accessibility to tumor tissue, systemic toxicity, development of multidrug resistance, and non-specific targeting that hinders further clinical applications.

In an attempt to circumvent side-effects and to improve therapeutic efficacy of chemotherapeutics, alternative approaches are highly desired and investigated. Nanoparticular delivery systems are promising tools to increase drug activity by maximizing drug availability leading to reduction of toxic effects of the drug.[1]

In this study, four types of drug nanoparticles (NPs) based on amphiphilic hyperbranched block copolymers were developed for the delivery of the chemotherapeutic DOX to breast cancer cells. It showed that DOX-loaded H30-PEG10k NPs exhibited much stable properties and marked cytotoxicity to the breast cancer cell lines. Confocal microscopy studies indicated that the cancer cells could internalize the DOX loaded NPs, which contributed to the sustained drug release. Additionally, drug loaded NPs induced more apoptosis than free DOX did (Figure).

Conclusion: Our findings indicate that the H30-PEG10k NPs may offer a very promising approach for delivering drugs to cancer cells.

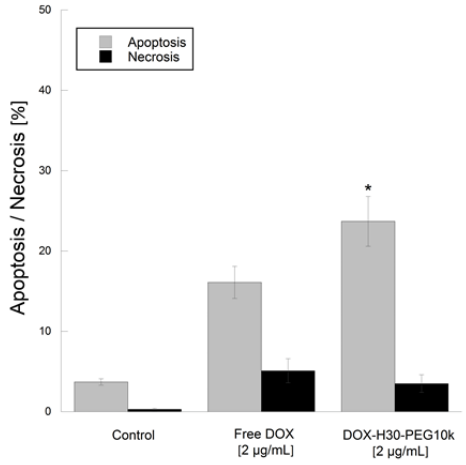

Figure. Effect of DOX loaded nanoparticles on the apoptosis and necrosis of MDA-MB-468 cells.

Literature

1.Ferrari, M., Cancer nanotechnology: Opportunities and challenges. Nature Reviews Cancer, 2005, 5 (3), 161-171.

Full citation

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