JOURNAL OF BIOMATERIALS SCIENCE, POLYMER EDITION
2022, VOL. 33, NO. 5, 551–568
https://doi.org/10.1080/09205063.2021.1998819

Gelatin nanoparticles via template polymerization for drug delivery system to photoprocess application in cells

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ABSTRACT

Photodynamic therapy (PDT) is a clinical treatment based on the activation of light-absorbing photosensitizers (PS) to generate reactive oxygen species, which are toxic to the targeted disease cells. Because most PS are hydrophobic with poor water solubility, it is necessary to encapsulate and solubilize PS in aqueous conditions to improve the photodynamic action for this compound. In this work, gelatin-poly(acrylic acid) nanoparticles (PAA/gelatin nanoparticles) *via* template polymerization for incorporation aluminum chloride phthalocyanine (ClAlPc) as a model drug for PDT application were developed. Biocompatible core-shell polymeric nanoparticles were fabricated *via* template polymerization using gelatin and acrylic acid as a reaction system. The nanoparticulate system was studied by scanning electron microscopy, steady-state, and their biological activity was evaluated using *in vitro* cancer cell lines by classical MTT assay. The obtained nanoparticles had a spherical shape and DLS particle size were determined further and was found to be around 170 nm. The phthalocyanine-loaded-nanoparticles maintained their photophysical behaviour after encapsulation. It is found that ClAlPc can be released from the nanoparticles in a sustained manner with a small initial burst release. *In vitro* cytotoxicity revealed that ClAlPc-loaded nanoparticles had similar cytotoxicity to free ClAlPc with mouse melanoma cancer cell line (B16-F10). *In vitro* photoeffects assay indicated that the nanoparticle formulation was superior in anticancer effect to free ClAlPc on mouse melanoma cancer cell line B16-F10. The results indicate that ClAlPc encapsulated in gelatin-poly(acrylic acid) nanoparticles are a successful delivery system for improving photodynamic activity in the target tissue.

ARTICLE HISTORY
Received 11 June 2021
Accepted 23 October 2021

KEYWORDS
Acrylic acid; gelatin; nanoparticles; phthalocyanine; photodynamic therapy

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