

## Study of Loading, Cytotoxicity, Uptake, and Release of Curcumin from a Novel Gemini Surfactant Nanocarrier

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Received: 14/Aug/2016, Accepted: 06/Nov/2016

### Abstract

**Objective:** Numerous researches have been conducted to comprehend the anti-cancer effects of curcumin (Cu). Although the anti-proliferative properties of Cu on cancerous cells is known, the clinical application of this gold substrate is limited. This limitation is mostly due to low solubility, inefficient bioavailability, rapid metabolism, and improper uptake. In this study, we have synthesized a novel biodegradable gemini surfactant (Gs), after which the curcumin (Cu) molecules were encapsulated within the polymer to overcome its physicochemical limitations.

**Methods:** We prepared Gs-Cu nanoparticles by the nanoprecipitation method. Size and polydispersity index of the nanoparticles were determined by the dynamic light scattering (DLS) technique. The release profile of Cu from the polymer matrix was studied, and the MTT assay and cellular uptake of Gs-Cu on MDA-MB-231 cells were investigated in vitro.

**Results:** The Gs polymer had the capability to form polymersomes in an aqueous solution; a narrow size distribution was obtained ( $PDI \approx 0.3$ ). The encapsulation efficiency approximated 87%. We observed a sustained release profile due to incorporation of Cu into the polymer matrix. The Gs-Cu complex showed more cytotoxicity compared to free Cu because of the higher rate of cellular internalization.

**Conclusions:** The data indicate that Gs polymersomes can be regarded as nanocarriers for hydrophobic curcumin molecules.

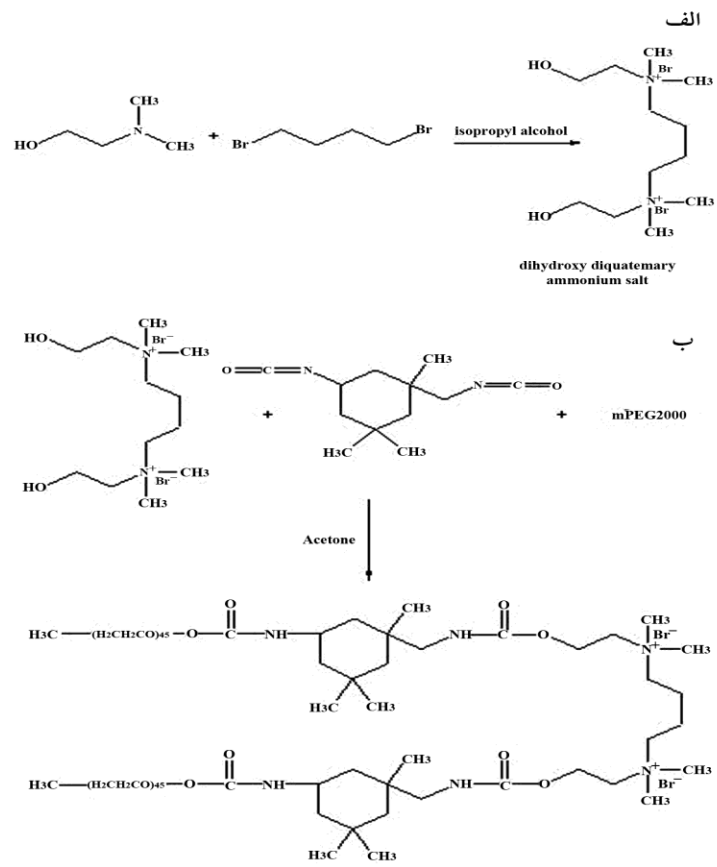
**Keywords:** Curcumin, Anti-cancer, Gemini surfactant, Nanocarrier, Polymersome

Pathobiology Research, Vol. 19 (2016-2017), No. 1, Pages: 13-27





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