

Preparation, characterization and cytotoxic effects of silica nanoparticles containing epirubicin

M. Hanafi-Bojd^{1,*}, B. Malaekheh-Nikouei², M. Jaafari², N. Ramezani³

¹*School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran*

²*Nanotechnology Research Center and School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran*

³*Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran*

Background and Aims: One of the best nanocarriers for drug delivery to cancer cells is mesoporous silica nanoparticles (MSN). This study aimed to develop mesoporous silica nanoparticles loaded by epirubicin in order to improve the cytotoxic properties of this anticancer drug.

Methods: In this study, we synthesized unmodified, aminated and phosphonated MSNs using sol-gel method. Epirubicin hydrochloride, an anticancer drug, was loaded into these nanoparticles. Nanoparticles were characterized using Fourier transform infrared spectroscopy (FTIR), transmission electron microscopy (TEM), BET surface area and particle size analyzer. Cytotoxicity of MSNs loaded by epirubicin was evaluated on MCF7 cell line.

Results: Mean size of MSNs in culture medium with serum was minimum level. Phosphonated MSN had the highest drug loading. In vitro release of drug in Phosphate Buffer Saline with pH 7.4 was slow whereas in acetate buffer with pH 5.5 was rapid. IC₅₀ of epirubicin was improved by loading in MSNs.

Conclusions: MSNs containing anticancer drug had a good cytotoxic effects on cancer cell and it can be a promising candidate for in-vivo drug delivery.

Keywords: Mesoporous silica nanoparticle; Epirubicin; Drug delivery; Cytotoxicity