Abstract

Introduction: The cytotoxic effects of celecoxib have been reported and its use in relation to dose escalation is directly related to death from cardiovascular causes, myocardial infarction, stroke, and heart failure. On the other hand, the anti-cytotoxic and protective effects of curcumin on cardiovascular cells have been proven, but its limitation is low solubility and consequently its bioavailability and low stability in the body. Therefore, it is loaded in solid lipid nanoparticles (SLN) coated with chitosan increase its bioavailability.

Methods: Using the dilution method, a calibration diagram was drawn and finally the equation of this diagram was used to determine the amount of unknown samples. The properties of nanoparticles were evaluated using techniques such as dynamic light scattering, Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy. The release pattern of the drug was evaluated using a dialysis bag and the concentration of the released drug was determined by visible ultraviolet spectroscopy. In vitro study of a number of rat exposed to cytotoxicity and measurement of cytotoxicity and lipid peroxidation, cardiac cell viability and reactive oxygen species (ROS) formation, mitochondrial damage and lysosomal membrane instability and oxidized glutathione (GSSG).

Results: The size of SLN nanoparticles with an optimal formulation of 137 nm was in the acceptable range for SLN nanoparticles. Entrapment efficiency and drug loading rate were calculated to be 90% and 11%, respectively. The results of FTIR indicate that is no chemical interaction between the carrier and the drug. Also, according to the results of FTIR and the presence of amide bonds between stearic acid and chitosan, the correctness of the structure was proved. The results of scanning electron microscopy show the spherical structure of nanoparticles. The drug release pattern in chitosan-coated nanoparticles is slower than in chitosan-coated nanoparticles. In vitro study of the drug in rat showed that nanoparticles with chitosan coating showed better performance in cell viability, cytotoxicity, ROS formation, mitochondrial damage, lysosomal membrane instability, glutathione, SDH activity and mitochondrial swelling than uncoated nanoparticles.

Conclusion: According to the findings of the study, it can be said that the loading of curcumin in chitosan-coated solid nanoparticles can be effective in preventing the cardiac toxicity of celecoxib.

Keywords: Bioavailability, Chitosan, Nanotechnology, Solid lipid nanoparticles, Curcumin, Toxicity, Celecoxib.