Investigating the effect of lipid nanoparticles containing silibinin anti-cancer drug on the growth of breast cancer MCF-7 cell line

Arsalan Karimi-Moghddam1, Narges Nikoonahad Lotfabadi1*, Bibi Fatemeh Haghiralsadat2, Mohammad Majdizadeh3

1. Department of Biology, Sciences Faculty, Science and Arts University, Yazd, Iran
2. Department of Advanced Medical Sciences and Technologies, School of Paramedicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
3. Department of Nano-Biotechnology, Nano-Biotech Foresight Company, Science & Technology Park of Yazd, Yazd, Iran

Corresponding author: nikounahad_1976@yahoo.com

Abstract

Background & Aim: Silibinin is a blend of flavonoids, which is extracted from Marianum Silybum, and its anti-cancer effects on breast cells have been studied. The aim of this study was to provide physiochemical evaluation of various formulations of the niosomal system containing silibinin, in order to achieve targeted formulation to better fight breast cancer cells.

Methods: Nano-carriers were synthesized using different molar ratios of structural elements such as Cholesterol, Polysorbates 20 and 60 and of the 9 synthetic formulations; the best formulation was selected based on the encapsulation efficiency. Then, the pattern of drug release in conditions similar to cancerous cells, the size of nano-carrier and surface charge were investigated. Furthermore, the interaction of drugs and nano-carriers was studied by investigating IR spectra and particle morphology using scanning electron microscopy. At the end, using the MTT method, niosomal silibinin toxicity was measured on the MCF-7 cell line.

Results: The final formulation containing silibinin, had 118nm size, 92.87±5% encapsulation efficiency, -31.33±0.9 mV zeta potential. The maximum release rate of the drug for this nano-carrier in cancerous cells within 48 hours was 89.03%. The results of MTT show that the amount of toxicity of encapsulated silibinins is higher than the non-encapsulated silibinin on MCF-7 cell line.

Conclusion: The results of this study showed that the niosomal system, having the proper physiochemical properties, increases the toxic effect of silibinin on MCF-7 cell line. Therefore, it can be a suitable carrier for drug delivery to cancer cells.

Keywords: Niosome, Silibinin, Drug Carriers, Anti-neoplastic Agents, MCF-7 cells