Abstract

Introduction: Dealing with cancer is a major challenge of modern medicine. Although many drugs are available and effective against cancer cells, drug resistance is a significant cause of therapy failure. Cancer cells can develop resistance by secreting anticancer drugs through P-gp pumps. However, nanoparticles loaded with drugs have been found to bypass this resistance mechanism by actively penetrating the cell membrane. Paclitaxel, a natural compound, is a commonly used chemotherapy drug for various types of cancer like breast, ovarian, and lung cancer. With this study, we aimed to load paclitaxel into lipid nanoparticles coated with chitosan.In this study, it was tried to load this drug in lipid nanoparticles coated with chitosan and the physicochemical properties of the drug and its effects were investigated.

Methods: Solvent diffusion method was used to prepare solid lipid nanoparticles containing paclitaxel. For the preparation of solid lipid nanoparticles containing paclitaxel by this method, two lipid and aqueous phases were needed. The fatty phase of the formulation was stearic acid and oleic acid, which entered the same phase after preparing the final formulation of paclitaxel. In order to investigate the morphological characteristics of nanoparticles, homogeneous or heterogeneous nanoparticle surfaces were examined by electron microscope. In order to investigate drug loading in NLC chitosan nanoparticles, drug release pattern from nanoparticles with nanostructured fat carriers and chitosan, experiments were performed in two different environments with different pH. Finally, the efficiency of the drug loaded in nanoparticles was evaluated using the MTT method.

Results: The drug retention percentage was calculated to be 96% and the loading was 15%. The percent release curve by dialysis bag method in nanoparticles with drug and coated after the first two hours was higher than the percent release curve of paclitaxel drug. In this graph, the release test continued until the concentration of the drug reached a uniform level (steady state). The percentage of survival of cancer cells decreased with the increase in the concentration of the drug and nanoparticle deposition, and then the nanoparticle with the drug, the drug alone and Nanoparticles without drugs were in the next categories respectively. IC-50 of drug was 533.2, nanoparticle and drug were 320.1, and nanoparticle and drug deposition was calculated as 251.0 nM.

Conclusion: Synthesized nanoparticles were measured in order to measure the zeta potential with a DLS device (zetasizer) and it was found that the nanoparticles with chitosan coating are nanometer in size. The examination of the morphological characteristics of the nanoparticles by electron microscope showed that the particles had an almost spherical structure with an inhomogeneous surface. The drug retention percentage was calculated as 96% with a standard

deviation of 0.01 and the loading was 15% with a standard deviation of 0.3. The percentage release curve by dialysis bag method in nanoparticles with drug and chitosan coating. The percentage of survival of cancer cells was the lowest with increasing drug and nanoparticle concentration, and then drug alone and nanoparticle without drug were in the next ranks, respectively. IC50 of drug was calculated as 533.2 nM, nanoparticle and drug as 251 nM.

Key words: Paclitaxel,Breast Cancer, Nanoparticles(NLC), Chitosan, MCF-7, Cytotoxicity