Drug containing polymeric nanoparticles are submicron-sized particles consisting of drug and polymer. Polymeric nanoparticles reflect in the world of upcoming research with better therapeutic effect and fewer side effects than conventional dosage form. Breast cancer is one of the most commonly occurring carcinogenic conditions in female patients. Chemotherapy is not gaining major importance because of number of the side effects out of which major disadvantage are toxicity to normal cells and poor retention of drug in cancerous cells.

Targeted drug delivery to tumor is achieved successfully by carrier mediated drug delivery systems like liposomes, nanosystems, microspheres, microparticles and dendrimers. In the present work, polymeric nanoparticles are prepared using three chemotherapeutic agents, Anastrozole, Colchicine and Docetaxel with the aim of better targeting and higher efficacy.

Polymeric nanoparticles are prepared by two methods. Chitosan nanoparticles are prepared by ionic gelatin method. Chitosan nanoparticles are subjected to study effect of process variables, like concentration of chitosan, concentration of sodium tripolyphosphate and mixing speed, and formulation variables like particles size and drug to polymer ratio. Gelatin nanoparticles are prepared by ethanol precipitation method, which are subjected to study effect of process variables like concentration of gelatin, ratio of water and ethanol, stirring speed, and formulation variables like particle size and drug to polymer ratio. Pegylation of chitosan nanoparticles and gelatin nanoparticles are also optimized and substantiated. All batches of nanoparticles are optimized on the basis of average particle size and percentage drug entrapment. Optimized batches are further lyophilized. Final formulations characterized for physicochemical properties (flowability and redispersibility), In-vitro parameters (cell line study) and In vivo parameters (elimination rate constant, biological half life, clearance, Mean residence time, AUC(0-8) and AUC(0-∞)).

Anastrozole loaded gelatin nanoparticles have higher entrapment with good in-vivo and pharmacokinetic behaviour. Docetaxel loaded PEGylated gelatin nanoparticles have less entrapment with very good pharmacokinetic behaviour. So, amongst all the six formulations Anastrozole loaded PEGylated gelatin nanoparticles and Docetaxel loaded PEGylated gelatin nanoparticles are chosen as better formulations.
Both formulations showed prolonged action upto 1 week (Once a week), reduced dosing frequency, more patient compliance, site specificity (reduced side effects) and longer circulation time (more efficient).

Keywords: Nanoparticles, Pegylation, Chitosan, Gelatin, Anastrozole, Colchicine, Docetaxel, Targeted Drug Delivery.