

## CHAPTER V

### CONCLUSION



The results of this study demonstrated that the electrospraying process is a simple technique for the production of chitosan, modified-chitosan/poly (lactic) acid nanoparticles. The morphology and size of these particles can be manipulated by controlling the parameters such as voltage, flow rate, needle gauge and working distance. The preliminary studies of the effects of electrospray parameters on the nanoparticle sizes and shapes showed that the CS-DOX and m-CS-DOX nanoparticles were successfully prepared using electrospray parameters as follows: working distance of 8 cm, needle gauge of 26 g, flow rate of 0.5 ml/s, stirring rate of 400 rpm and electrospraying voltage of 13 kV. Moreover, CS/PLA-DOX and m-CS/PLA-DOX nanoparticles were successfully prepared using electrospray parameters as follows: working distance of 8 cm, needle gauge of 20 g, flow rate of 10 ml/h, stirring rate of 800 rpm and electrospraying voltage of 10 kV. The polymer-DOX nanoparticles are in a spherical shape with a diameter within a nanometer range. The size distribution of polymer-DOX nanoparticles are narrow and produce high entrapment drug efficiency over 60%. The CS/PLA-DOX nanoparticles provided the prolonged release of DOX extended to 26 days. The release profiles of doxorubicin were greatly sustained upon using modified-chitosan with increasing the weight ratio of poly (lactic acid). Overall, it was clearly shown that the most sustained release profile was achieved with the formulation of 2.0% doxorubicin loaded modified-chitosan mixed poly (lactic acid) at the weight ratio of 1:2.

The Topoisomerase II assay revealed that most of polymer-DOX inhibited Topoisomerase II with over 50% inhibition. The (m-CS/PLA)-DOX (1:2 w/w)-2% showed the most potent inhibition of Topoisomerase II enzyme with 78.69% inhibition. Thus, the electrospray technique is a promising technique for the fabrication of micro/nanoparticles-based drug delivery systems. The obtained polymer-DOX nanoparticles may be an advantageous alternative form for parenteral sustained release formulation, which is helpful for the treatment of cancer.