ISSN: 1391-8796
Proceedings of
2nd Ruhuna International Science & Technology Conference
University of Ruhuna, Matara, Sri Lanka
January 22-23, 2015

Iron nanoparticle based drug delivery system for the effective treatment of pancreatic cancer

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With the advancement of nanotechnology, novel drug delivery systems based on nanomaterials as vehicles have been introduced, having the potential of delivering conventional chemotherapeutic agent selectively to the targeted cancer sites following macromolecular transportation through tumor blood vessels by means of angiogenesis. In this particular research, a Fe/Fe_3O_4 nanoparticle based system is constructed by tethering a chemotherapeutic prodrug of doxorubicin and tumor homing/ uptake peptide sequences to dopamine units that are located at the Fe_3O_4 interface of the Fe(0) nanoparticles. Once the nanoparticles are selectively introduced to the targeted areas, the prodrug is activated due to the acidic environments in the interstitium and (after uptake) the endosome, which causes corrosion of the nanoparticle and release of the drugs and peptide sequences from the nanoparticle's surface. The cytotoxicity of these nanoformulations was tested against murine pancreatic cancer cell lines (Pan02) to assess their therapeutic capabilities for effective treatments of pancreatic cancers. The optimization of the Fe/Fe_3O_4 nanoparticle based drug delivery system and its therapeutic effects was carried out using a statistical analysis method known as response surface methodology.

Key Words: Pancreatic cancer, Nanotechnology, Response Surface Methodology

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