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Development of 5-fluorouracil enteric -coated nanoparticles for sustained and localized release and their *in vitro* characterization for treatment of colorectal cancer

Shashank Tummala and **M N Satish Kumar**
JSS College of Pharmacy, India

5-Fluorouracil is used in the treatment of colorectal cancer along with oxaliplatin as first line treatment, but it is still having lack of site specificity and poor therapeutic effect. Apart from that it exhibits toxic effects to healthy cells and decrease the drug availability at colon region. These limitations were overcome by formulating them as enteric- coated chitosan polymeric nanoparticles as drug can be delivered directly to large bowel. The main reason for opting for enteric coating is due to its protection of drug at gastric pH. So the main objective was to prepare polymeric nanoparticles using chitosan with different ratios of polymer (1:1, 1:2, 1:3, 1:4) by solvent evaporation emulsification method. It was then characterized by differential scanning calorimetry (DSC), X-ray diffraction (XRD), entrapment efficiency and particle size and further subjected to enteric coating. Dialysis bag technique was selected to determine drug *in vitro* release using various simulated fluids with pH (1.2, 4.5, 7.5, 7.0) to mimic the GIT tract. 5-FU nanoparticles with drug: polymer ratio of 1:2 and 1:3 has shown better particle size (149±1.28 nm and 138±1.01 nm respectively), entrapment efficiency (48.12±0.08% and 69.18±1.89 respectively). Comparative approach with non-enteric coated tablets shows a better drug release for 5-FU E1 after 4 h (initial burst release) followed by sustained release of 82% till 24 h, where as non enteric coated tablet released more than half the amount of the drug before reaching the colon area. So, these results conclude the usage of prepared nanoparticles as a potential drug delivery approach for the treatment of colorectal tumors.

tummala.shashank@outlook.com

Porous carrier based multiparticulate technology for effective gastro-retention of therapeutics

Sunil K Jain
Guru Ghasidas Vishwavidyalaya, India

Floating drug delivery system (FDDS) with extended residence time in the stomach could be of great importance for drugs with an absorption window in the upper small intestine. FDDS have been expected to remain floating in the gastric contents which results in the enhancement of bioavailability as well as effective usage of the drugs. Floating microspheres are specially noticed due to their wide applicability in the targeting of various drugs to the stomach. These floating microspheres have the advantage that they stay buoyant and dispersed uniformly in the gastric fluid. Multiparticulate low-density particles further successfully prolongs the gastric retention time of various drugs. Low-density porous carriers have been used by researchers for formulation of FDDS. Porous carriers are low-density solids with an open or closed pore structure and offer large exposed surface area for drug loading. Examples of pharmaceutically exploited porous carriers include porous silicon dioxide (Sylysia®), polypropylene foam powder (Accurel®), porous calcium silicate (Florite®), magnesium aluminometa silicate (Neusilin®), porous ceramic, etc. Floating microspheres and floating granules of Repaglinide and Orlistat using low density calcium silicate (CS) as a porous carrier were developed. The designed formulations had shown good performance in terms of floating ability with excellent controlled release behavior. The relative bioavailability of Repaglinide loaded floating microspheres was also found to be raised about 3.17 times in contrast to that of the marketed tablet. Developed systems could serve as platform technology for future research on this domain. Future work in this direction should be targeted towards use of such porous carriers for the development of floating multiparticulate delivery systems. The coming years represent a critical time in this field as commercial applications of FDDS to be explored.

Notes:

suniljain25in@yahoo.com