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Curcumin loaded nanoparticles of a grafted copolymer for the treatment of inflammatory bowel disease

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Novel pH-sensitive hydrolyzed polyacrylamide-grafted-xanthan gum (PAAm-g-XG) nanoparticles (NPs) loaded with curcumin were prepared for the colonic delivery in the treatment of inflammatory bowel disease (IBD). PAAm-g-XG copolymer was synthesized by free radical polymerization mechanism by grafting PAAm on the backbone of XG with the aid of ammonium persulfate. Independent factors including drug and polymer content, concentration and volume of AlCl_3 solution, volume of organic and aqueous phases, and sonication parameters were varied to optimize curcumin loaded NPs. The optimized nanoparticles (CN20) freeze dried with 10% w/v mannitol were spherical in shape (as assessed by scanning electron microscopy and transmission electron microscopy) with an average size of 425 nm. In-vitro drug release studies demonstrated that, these NPs displayed good resistance to drug release in acidic media. In pH 1.2, 4.6 and 6.8 buffer solutions, a total of <30% cumulative amount of drug was released over 6 h; whereas, 82.88% release was observed in pH 7.4 phosphate buffer within 6 h, which confirms ionization and electrostatic repulsion of COO^- functional groups of NPs leading to a path for drug and pH dependent solubility of the grafted polymer. In addition to pH-sensitivity, microflora activated property as indicated by >90% release of curcumin within 2 h in pH 7.4 containing 1% w/v rat caecum content, makes this polymer suitable for colon targeting. Curcumin NPs found to attenuate colitis in acetic acid induced IBD rats with alleviation of myeloperoxidase and nitrate levels, and normalization of body weight, colon length and colon weight. High T_{max} of NPs compared to plain curcumin established occurrence of curcumin absorption after reaching colon and increased C_{max} (~3 fold) and AUC (~2.5 fold) concluded enhanced absorption and effectiveness.

Biography

Neelam Suthar completed her Masters in Pharmaceutics from Manipal University. She has published 1 paper on drug delivery in a reputed journal. She is currently working as a Pharmacist in Kenya.

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