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Design of ligand anchored polymeric nanoparticles for potential targeted drug delivery in intestinal inflammation

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Ulcerative colitis (UC) is characterized as inflamed intestinal mucosa of gastrointestinal tract, particularly affecting colon and rectum. It is one of the most common types of inflammatory bowel disease (IBD). Inflammation of intestine led to various pathophysiological events and recruited immune cells including T-cells and macrophages to the inflamed site. Both naïve and recruited macrophages expressed various surface receptors that can be exploited for targeted drug delivery in UC. Considering this fact, ligand conjugated polymeric nanoparticles, galactose-PLGA (GAL-PLGA NPs), were developed that specifically target macrophage galactose type-lectin-C (MGL-2) receptor. The O/W emulsion-evaporation method was adopted, and several study parameters were optimized using QBD approach and Box-Behnken design. The resulted GAL-PLGA NPs have smaller particle size and good encapsulation efficiency. The physical state characterization (TGA, XRD, FTIR) revealed stability and amorphous state of the nanosystem. In-vitro cell-based evaluation indicated biocompatibility with blood cells, peritoneum derived macrophages and colon cells. Further, GAL-PLGA NPs have significant uptake by murine macrophages and colon cells. In-vivo biodistribution and localization study in the dextran sodium sulfate (DSS) induced colitis model confirmed the potential of GAL-PLGA NPs to accumulate at the inflamed intestine. Thus, the ligand based nano-formulation have improved properties to target intestinal macrophages and to reside at the inflamed site for prolonged time for sustained drug efficacy [1].

References

1. Zeeshan M., et al. Mater. Sci. Eng. C. 126, 112183 (2021).