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## On demand delivery of methotrexate from self-assembled nanoconstructs for treatment of rheumatoid arthritis

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The aim of the present investigation was to develop and evaluate on demand delivery of methotrexate from self-assembled nanoconstructs for treatment of rheumatoid arthritis. Methotrexate (MTX)-Dextran sulfate (DS)-Poly lactic co-glycolic acid (PLGA) nanoparticles (NPs) can target at inflammatory joints to rheumatoid arthritis if given in the form of nanoparticles as parenteral dosage form. MTX-DS-PLGA NPs was successfully prepared using methotrexate, poly (lactide-co-glycolide) acid (PLGA), dextran sulfate and lecithin by nanoprecipitation method and evaluated for particle size, zeta potential, percent drug entrapment, percent drug loading, surface morphology (Transmission Electron Microscopy), *in-vitro* drug release study, sterility testing and stability study. Optimization of formulation parameter was done by Box behnken design (BBD) using Design Expert software. Optimization study of formulation parameter shows that batch prepared with Drug: DS (1:0.5), PLGA: (Drug: DS) (80:20), Lecithin (1.25% w/w). Particle size and zeta potential were found to be 146.40 $\pm$ 10.64nm and -37.1 $\pm$ 6.32 respectively for optimized batch. Percent drug entrapment, Percent drug loading were found to be 98.80 $\pm$ 0.8% and 9.6 $\pm$ 0.81% respectively. Transmission Electron Microscopy (TEM) study indicates that the particles were found to be in spherical shape and porous in nature. *In-vitro* drug release were found to be and 94.90 $\pm$ 0.51% in 48hrs. The results of sterility test which described that MTX-DS-PLGA NPs was successfully sterile. Stability study shows developed NPs was 5% RH (Refrigerator; RF) condition after one month. The present study $\pm$ C/45° 2 $\pm$  stable at 4-8 demonstrated that nanoparticles may target at blood stream to the inflammatory joints of rheumatoid arthritis with least systemic toxicity.

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