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Development of Ketorolac Tromethamine Encapsulated Stealth Liposomes: Pharmacokinetics and Bio Distribution

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Abstract : Ketorolac tromethamine (KTM) is a non-steroidal anti-inflammatory drug with a potent analgesic and anti-inflammatory activity due to prostaglandin related inhibitory effect of drug. It is a non-selective cyclo-oxygenase inhibitor. The drug is currently used orally and intramuscularly in multiple divided doses, clinically for the management arthritis, cancer pain, post-surgical pain, and in the treatment of migraine pain. KTM has short biological half-life of 4 to 6 hours, which necessitates frequent dosing to retain the action. The frequent occurrence of gastrointestinal bleeding, perforation, peptic ulceration, and renal failure lead to the development of other drug delivery strategies for the appropriate delivery of KTM. The ideal solution would be to target the drug only to the cells or tissues affected by the disease. Drug targeting could be achieved effectively by liposomes that are biocompatible and biodegradable. The aim of the study was to develop a parenteral liposome formulation of KTM with improved efficacy while reducing side effects by targeting the inflammation due to arthritis. PEG-anchored (stealth) and non-PEG-anchored liposomes were prepared by thin film hydration technique followed by extrusion cycle and characterized for in vitro and in vivo. Stealth liposomes (SLs) exhibited increase in percent encapsulation efficiency (94%) and 52% percent of drug retention during release studies in 24 h with good stability for a period of 1 month at -20°C and 4°C. SLs showed about maximum 55% of edema inhibition with significant analgesic effect. SLs produced marked differences over those of non-SL formulations with an increase in area under plasma concentration time curve, $t_{1/2}$, mean residence time, and reduced clearance. 0.3% of the drug was detected in arthritic induced paw with significantly reduced drug localization in liver, spleen, and kidney for SLs when compared to other conventional liposomes. Thus SLs help to increase the therapeutic efficacy of KTM by increasing the targeting potential at the inflammatory region.

Keywords : biodistribution, ketorolac tromethamine, stealth liposomes, thin film hydration technique
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