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Design and synthesis of glycerol monostearate derived amphiphilic Janus type polyester dendrimers as scaffold for nano drug delivery

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A new class of asymmetric dendrimers popularly known as Janus dendrimers has been recognized as promising nano carriers for therapeutic drugs and biomedical applications. There is a need for the design and synthesis of tailor made novel Janus type biocompatible and biodegradable dendrimers due to their limited availability. Therefore, a new type of amphiphilic janus type dendrimers (GMSG1-G3) containing glycerol monostearate (GMS) as a hydrophobic tail and polyester functionality as a hydrophilic head group were designed, synthesized and evaluated for toxicity. The synthesis for GMSG1 to G3 was undertaken using an iterative esterification and deprotection reaction sequence. Coupling chemistry using p-dimethylamino pyridine (DMAP) and 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDAC.HCl) was used for esterification whereas deprotection was achieved using hydrochloric acid (HCl). FT-IR, NMR (1H and 13C) and HRMS techniques were used for structural characterization. Biocompatibility was evaluated on MCF-7 cell lines using the MTT assay. Analytical data obtained (FT-IR, NMR, HRMS) confirmed the structures of GMSG1-G3. The % cell viability was >80 % for all the dendrimers. This confirmed our hypothesis of using GMS as a safe pharmaceutical lipid excipient and biocompatible polyester head to obtain non-toxic Janus type dendrimers. The tedious and multistep synthesis involving the use of numerous reagents restricts the cost effective synthesis of Janus dendrimers and limits their applications. The synthesis of GMSG1-G3, reported herein is easy and sophisticated with simple protection and deprotection chemistry. GMSG1 to G3 which are found to be non-toxic to mammalian cells can be exploited further for their biological applications.

Biography

Dhiraj R Sikwal has completed his Masters from University of Pune, India and currently pursuing Doctoral studies at Department of Pharmaceutical Sciences at University of KwaZulu-Natal Durban. He is being engaged in designing and synthesis of various dendritic polymers for nano antibiotic delivery under guidance of Professor Thirumala Govender.

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