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Engineering of gelatin for controlled drug delivery applications

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Gelatin has been extensively investigated as a delivery vehicle for many classes of drugs because of its inherent biocompatibility, nontoxicity, biodegradability, and improved pharmacokinetic profile and drug efficacy. Million pounds of gelatin is used annually for various pharmaceutical uses. Its digestive process confers very low antigenicity with the formation of harmless bioresorbable metabolic degradation products. Gelatin has also proven to be versatile by its intrinsic features that enable loading of various bioactive molecules either by alkaline or acidic treatment or by tailoring its structure, hydrophobicity and isoelectric point, based on the structure and properties of the desired drug. The aqueous high solubility, heterogeneity in molecular weight, poor structural and thermal stability of gelatin which may not promote a controlled drug delivery, can be fine- tuned independently to optimize drug loading, swellability and reproducible release kinetics by altering its molecular weight, hydrophobicity and crosslink density. This promoted gelatin as an exceptionally adaptable drug carrier as evidenced by its applications in controlled delivery, tissue engineering, cancer therapy, therapeutic angiogenesis and gene therapy. The presence of cell recognition motif such as Arg-Gly-Asp in its structure which improves the final biological performance of gelatin over synthetic polymers, availability of a wide variety of bioactive agents, production of human recombinant gelatin and the synergistic use of gelatin with several other materials resulted in the development of more advanced gelatin based controlled release systems. It may serve as a potential carrier for controlled oral delivery of peptides and protein drugs for the treatment of numerous diseases. Gelatin based carrier matrices such as microparticles, nanoparticles, hydrogels, fibers etc. can be fabricated for controlled-release of drugs. The present lecture will review the studies on the gelatin and modified gelatin as controlled drug delivery vehicles along with our original research work on characterization and in vitro evaluation of the drug delivery features of diisocyanate cross-linked gelatin hydrogel as a carrier for controlled drug delivery taking 5-fluorouracil and theophylline as model drugs.

Biography

K Subramanian has completed his MSc in 1978 from Madras University, PhD in Polymer Chemistry in 1996 from Indian Institute of Science Bangalore, India and DSc in 2007 from Yorker International University, Italy. He has worked as a R&D Scientist from 1980-2002 on polymers, chemicals & materials for space applications, Indian Space Research Organization, Government of India, India. He was a Senior Professor since 2002 at Department of Biotechnology, Bannari Amman Institute of Technology, India. His current research focus are polymer carriers for controlled drug delivery, superabsorbent polymers, microbial fuel cell, effluent treatment, biofuel, polymer nanoparticle as drug carriers etc. He is a Member of American Chemical Society (since 2006) and was a Member of American Association for Advancement of Science, USA. He has published more than 30 original research papers in reputed journals.

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