

Gels Horizons: From Science to Smart Materials

Vijay Kumar Thakur
Manju Kumari Thakur *Editors*

Polymer Gels

Synthesis and Characterization

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Chapter 6

Polymeric Hydrogel: A Flexible Carrier System for Drug Delivery



Surbhi Dubey, Rajeev Sharma, Nishi Mody and S. P. Vyas

1 Introduction

Progress in modern drug delivery and in the area of polymer science has shifted the interest on polymer-based drug delivery systems to obtain spatiotemporal release of the therapeutics. The advent of effective and precise biological therapeutics has accelerated the polymer-based smart delivery systems for both pulsatile dose delivery and implantable reservoir systems. A great number of polymers of both natural and synthetic origin constitutes a vital area of biopharmaceutics in which linear or branched polymer chains have been exploited as polymeric drug carriers.

A through study of underlying mechanisms of transitional behaviour of polymers under applied stimulus can help design the polymers with well-ordered molecular and structural to give a well-defined reaction to the external conditions. Such stimuli responsive polymers are used for formulating sensitive carriers which deliver drug(s) in response to the varying biological conditions/stimulus present in body. Polymers carrying therapeutics can themselves be bioactive which in addition to drug provide their own therapeutic benefit as well. These polymers are biodegradable and prevent carrier accumulation in the biological system. Pharmaceutical agents can also be conjugated to the polymer through biologically labile bonds to dissociate in particular bioenvironment in response to change like pH, temperature, enzyme or ionic strength etc. The polymer-drug conjugation provides advantages including prolonged circulation half-life and sustained the drug release. Active targeting can be achieved by conjugating the polymeric backbone with the ligand specific to the overexpressed cell surface receptor of the affected tissue. The targeted nanocarriers which are taken up by the receptor mediated endocytosis are taken up by the endosome follow an endolysosomal pathway

S. Dubey (✉) · R. Sharma · N. Mody · S. P. Vyas
Drug Delivery Research Laboratory, Department of Pharmaceutical Sciences,
Dr. H.S. Gour University Sagar, Sagar 470003, M.P., India
e-mail: surbhi.dubey3@gmail.com