CHAPTER 4

Mechanisms of Drug Release from Hydrogels in Medical Applications

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Introduction

Hydrogels have proven invaluable in the field of drug delivery. Modification of the physical and chemical properties of these systems allows a network to be created in which drug molecules may be entrapped and drug release may be engineered. There are a wide range of polymers currently employed for this purpose. For example, hydrogels such as poly(2-hydroxyethylmethacrylate) (HEMA) have been used in contact lenses, catheter coatings and wound healing platforms; cellulose derivatives such as hydroxypropyl methyl cellulose (HPMC) have become one of the most popular categories of hydrophilic polymers associated with pharmaceutical systems and polyvinyl alcohol (PVA) has also been utilized in a wide range of pharmaceutical applications (Liechty et al. 2010; Hoffman 2001; Peppas et al. 2000). These polymers are capable of interacting with surrounding solvent and imbibing large quantities of water into the structure. The adaptable nature of this property creates the ideal platform for a myriad of drug loaded devices and formulations with varying release profiles (Alkayyali et al. 2012; Hoare and Kohane 2008; Vashist et al. 2014; Vasheghani-Farahani and Ganji 2009).

Hydrogels are versatile drug carriers and can be tailored for a range of applications, as previously highlighted. Drug release is dependent on the chemical nature of the platform and the network structure created. One of the most influential factors to modulate drug release from a hydrogel is the presence of cross-linking

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