CHAPTER 5

Hydrogel Coatings for Medical Device Applications

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Introduction

Upon implantation of a medical device into the body, initial interactions with the surrounding tissue are governed by properties of the device surface, such as hydrophilicity, surface energy, roughness and conductivity (Goodman et al. 2013). Facile manipulation of these surface properties to enhance the success of device integration within the body is now possible via the application of hydrogel coatings. The exact range of desired properties is dependent on the intended application and site of device implantation, however requisite properties common to all medical device coatings include biocompatibility, ease of application, flexibility, stability for the intended duration of use, adherence to the substrate, and durability to withstand mechanical trauma and shear forces encountered during implantation and *in vivo* (Lawrence and Turner 2005). In this chapter, osseointegration, haemocompatibility and lubricity, which are of key importance for bone-contacting, blood-contacting and urinary devices respectively, will be considered in turn (Kulkarni et al. 2014).

Hydrogel-coated devices have been used clinically for over two decades (Metha et al. 2015). These polymers constitute attractive materials for medical device coatings on the basis of their characteristic biocompatibility, resistance to non-specific macromolecular adhesion and similar degree of flexibility to body tissue (Yu et al. 2008). In addition, the swelling capacity of hydrogels facilitates the entrapment and subsequent release of therapeutically-relevant doses of active agents, including antibiotics, silver ions, growth factors and antimicrobial peptides (Mattioli-Belmonte

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