A Review of the Biocompatibility of Implantable Devices: Current Challenges to Overcome Foreign Body Response

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Abstract

In recent years, a variety of devices (drug-eluting stents, artificial organs, biosensors, catheters, scaffolds for tissue engineering, heart valves, etc.) have been developed for implantation into patients. However, when such devices are implanted into the body, the body can react to these in a number of different ways. These reactions can result in an unexpected risk for patients. Therefore, it is important to assess and optimize the biocompatibility of implantable devices. To date, numerous strategies have been investigated to overcome body reactions induced by the implantation of devices. This review focuses on the foreign body response and the approaches that have been taken to overcome this. The biological response following device implantation and the methods for biocompatibility evaluation are summarized. Then the risks of implantable devices and the challenges to overcome these problems are introduced. Specifically, the challenges used to overcome the functional loss of glucose sensors, restenosis after stent implantation, and calcification induced by implantable devices are discussed.

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Abbreviations: (ECM) extracellular matrix, (ISO) International Organization for Standardization, (MTT) 3-(4,5-dimethylthiazol-2-yl)-2,5diphenyltetrazolium bromide, (MEM) modified eagle's medium, (PEG) poly(ethylene glycol), (PLA) poly(lactic acid), (PLGA) poly(lactic-co-glycolic acid), (PVA) poly(vinyl alcohol), (TGF) transforming growth factor, (VEGF) vascular endothelial cell growth factor

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