

CYTOMORPHOLOGICAL EVALUATION OF THE TISSUE-IMPLANT RESPONSE SURROUNDING SUBCUTANEOUS UHMW-PE IMPLANTS TREATED WITH PEPTIDES THAT INFLUENCE ADHESION

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ABSTRACT

Polyethylene materials used in biomedical applications are highly compatible and non-immunogenic with host tissues. Ultra-high molecular weight polyethylene (UHMW-PE) has been widely used in orthopedic and dental applications to achieve bone integration. Because of the increased use of UHMW-PE materials in soft-tissue applications, further elucidation of this material *in vivo* to further evaluate the mechanisms involved in tissue-implant adhesion and biocompatibility are needed. The purpose of this investigation was to describe the tissue-implant response resulting from the subcutaneous implantation of UHMW-PE rinsed with saline (control) or coated with poly-L-lysine (PLL), arginine-glycine-aspartic acid (RGD), or arginine-glycine-glutamic acid (RGE). In this investigation, implants of PE rinsed in saline (control) or coated with RGD, RGE, or poly-L-lysine were implanted into 16 adult male rats subcutaneously. The animals were euthanized at 90 days post-implantation, and the PE devices and encapsulating fibrous tissue were harvested. Evaluation of routinely stained sections (5µm, Hematoxylin & Eosin) of the fibrous tissue capsule surrounding the PE implants revealed the following: 1) all the devices had fibrous connective tissue capsules of slightly varying degrees of thickness surrounding them present at the time of sacrifice, and 2) the number of macrophages and fibrocytes present in the fibrous tissue capsules surrounding the peptide-coated devices differed markedly than those retrieved from the saline-washed group (ANOVA, $p<0.05$).

Keywords: tissue-implant response, amino acid, peptide coating, ultra-high molecular weight polyethylene, macrophage, neutrophils, neovascularity

INTRODUCTION

Synthetic biomaterials must promote and interact with host tissue to restore or complement function. Ultra-high molecular weight polyethylene (UHMW-PE) is an inexpensive polymer used in many medical, dental, and industrial applications because it can withstand the living host environment for extended periods [1-2].

Previous investigations in our laboratory have evaluated the performance of UPMW-PE as a candidate component material when implanted in the peritoneal cavity [3-8]. Some of these studies have demonstrated that the tissue-implant response can be manipulated by several factors, including the composition of the implant, drug or biological being delivered, implantation site, and surface chemistry.