

DIFFERENTIAL CELL ADHESION TO PHOSPHORYLCHOLINE POLYMERS WITH VARYING CATIONIC CHARGE.

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INTRODUCTION: The adhesion and proliferation of cells to biomaterials is key to the biological acceptance and integration of many medical devices within a host. Kottee-Marchane et al 1996 showed that the success of vascular stents is greatly improved following adhesion and growth of vascular endothelial cells over the stent surface. This study evaluates the adhesion of cells to a series of phosphorylcholine (PC) polymer coated materials in order to assess whether cationic charge would modulate adhesion of specific cell type.

METHODS: Phosphorylcholine polymers containing varying amounts of cationic charge were coated on to poly(ethyleneterephthalate) (PET). The adhesion of rabbit corneal epithelial cells, mouse fibroblast cells and bovine vascular endothelial cells were investigated by incubating the materials with 6000 cells cm⁻² in 5% CO₂ at 37°C for up to 3 days. At daily intervals, cells adherent to the material surfaces were fix with methanol and stained with DAPI stain. The number of adherent cells was quantified manually under a fluorescent microscope at x 400 magnification.

RESULTS: Figure 1 shows the adhesion of corneal epithelial cells to the different substrate surfaces. Results indicate that both cell adhesion and proliferation is dependent on material composition. Samples with 0% charge showed no cell adhesion. No clear pattern in cell adhesion was seen with varying cationic charge although the number of cells adherent to PC polymers with 20 and 30% charge was generally lower than samples with 5, 10 and 15%. Figure 2 shows the adhesion of fibroblast cells to the different substrate surfaces. Results indicate that both cell adhesion and proliferation is dependent on material composition. Samples with 0% charge showed little to no cell adhesion. As cationic charge increase to 10% the number of adherent cells also increased, with then number of cells generally increasing with time. Above 10% little difference between samples is seen in the number of adherent cells. Figure 3 shows the adhesion of endothelial cells to different substrate surfaces. Results indicate that both cell adhesion and proliferation is dependent on material composition. All samples showed little to no cell adhesion.

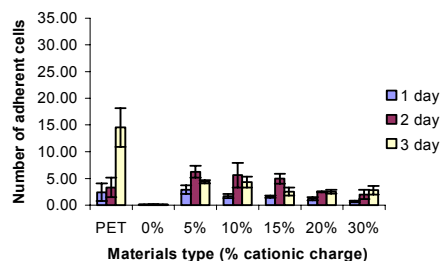


Fig. 1. Corneal epithelial cell adhesion to phosphorylcholine polymers varying in cationic charge.

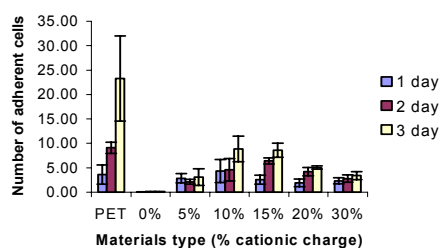


Fig.2. Fibroblast cell adhesion to phosphorylcholine polymers varying in cationic charge.

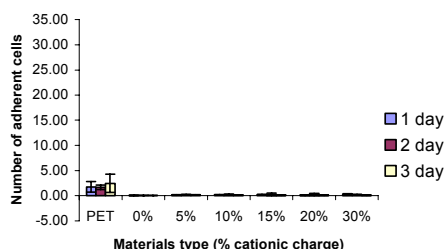


Fig. 3 Endothelial cell adhesion to phosphorylcholine polymers varying in cationic charge.

Conclusion: Adhesion to biomaterials is dependent on both material composition and cell type. The addition of cationic charge to the PC polymer appeared to increase the adhesion of both fibroblast and epithelial cells. This is consistent with other studies; Kishida et al 1991 and Dekker and Beugeling 1991 showed that cationic charge encourages cell adhesion. Cationic charge did not however increase the adhesion of endothelial cells in this study. Increasing cationic charge does not increase epithelial and fibroblast cell adhesion beyond a maximal value. This may be attributed to

the adsorption of proteins onto the cationic surface.

References: 1. Kotte-Marchane et al 1996 Journal of Biomedical Materials Research 30, 209-220
2. Kishida et al 1991 Biomaterials 12 786-792
3. Dekker and Beugeling 1991. In 'Modern aspects of Protein Adsorption on Biomaterials' 25-28 Missirlis Y. F. and Lemm W. (eds). Kluwer Academic Publishers. Printed in the Netherlands