

Correlation of Protein Adsorption and Cell Adhesion on Polymeric Surfaces

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INTRODUCTION:

It is widely accepted, that cell growth and viability depend on surface charge, charge density, wettability, hydrophobicity/hydrophilicity and surface-morphology.¹ However, hydrophilicity itself is only a marginal parameter for the attachment of cells to surfaces.² It is also known that cells interact with proteins of the extra cellular matrix (ECM) to enhance cell viability.³ Certain oligopeptide-sequences mimic the ECM- proteins (RGD and others) and ligands (integrins) of the cell membrane and thus improve cell adhesion.⁴⁻⁸

However, large scale surface modification with oligopeptides such as RGD is impeded by several factors. The most important two are their low bio stability and the high costs when used for surface modification. Synthetic polymers on the other side are stable and readily available with a wide range of properties. Hence, a deeper understanding of the mechanisms that govern the cell-material interactions as a function of physical and chemical characteristics of the polymers is desirable.

In this study we compare selected physical parameters (contact-angle, swelling-degree) of a range of polymers and their tendency to adsorb proteins to their interaction Human Micro Vascular Endothelial Cells (HMVEC).

RESULTS & DISCUSSION:

In this study we used benzophenone containing co- and terpolymers which upon UV-irradiation form surface-attached polymer networks.

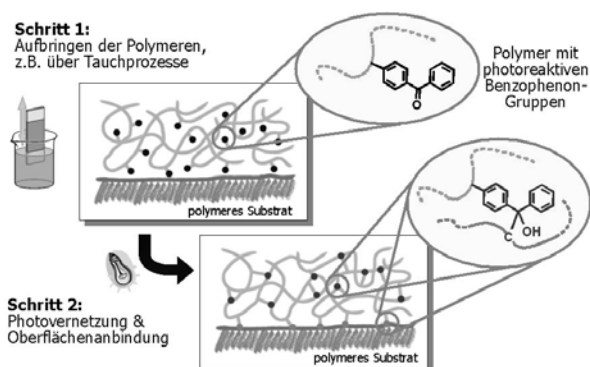


Figure 1: Illustration of the photo induced cross linking of Benzophenone containing polymers

During these studies we investigated a wide range of benzophenone containing polymers such as

polystyrene, polydimethylacrylamide, poly-2-hydroxymethacrylate, polymethylmethacrylate, polyethyloxazoline and various comb-PEG-polymers.

Protein adsorption and swelling of the polymer layers was investigated by surface-plasmon-spectroscopy and surface wave guide-spectroscopy respectively. As model system for the study of protein adsorption on thin polymer films Fibrinogen was chosen, because it is known to strongly adsorb to a wide range of different surfaces.

Cell culture tests have been conducted using HMVEC on a wide range of different polymer network modified surfaces.

A strict correlation between protein adsorption and cell-growth on uncharged polymer network surfaces was found. Furthermore it could be shown that a protein-repelling, uncharged surface is also not attractive for the attachment of HMVEC.

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