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SURFACE MODIFICATION OF PORCINE HEART VALVE IMPLANTS FOR REENDOTHELIALISATION

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INTRODUCTION: Porcine heart valves are interesting as replacements for aortic valves because they exhibit good blood compatibility, i.e. low thrombogenicity. However, due to the need for mechanical strengthening of the collagen surface of these bioimplants by Glutaraldehyde crosslinking the surfaces become toxic and are now prone to calcification. This process finally leads to implant failure and reduces the life time of the valve to 7 - 10 years in an adult. It has been shown previously that the seeding of endothelial cells on the implant surfaces significantly reduces the calcium uptake [1]. But cell growth on the surfaces is rather difficult due to their toxicity. Our approach to make the collagen surface of porcine heart valves again attractive for endothelial cell growth is to "mask" the toxic groups by coverage of the surface with a thin polymer coating. These polymers contain benzophenone moieties as photo crosslinkable group and to covalently attach the layer to the tissue-surface.

RESULTS & DISCUSSION: In this paper we present a robust and versatile technique for the photochemical generation of surface-attached polymer networks on the surfaces of tissue material. The approach is based on a copolymer that contains one comonomer that carries a Benzophenone moiety. This group can be activated to form a biradical triplet state if illuminated with UV light (λ = 350nm). This triplet can react with almost any aliphatic C-H group to form a crosslink. The process is schematically depicted in Figure 1. If a polymeric or biological substrate is used the same reaction takes place between the BP-Groups and surface-bound C-H groups and, thus, the polymer network is also anchored to the surface. The process is schematically depicted in Figure 2. We will present data from investigations on the overall photochemical process along with results that aim at understanding of how such layers interact with model liquids that contain biological material that is also found in the blood stream. Furthermore we present preliminary results of cell seeding experiments on these surfaces.

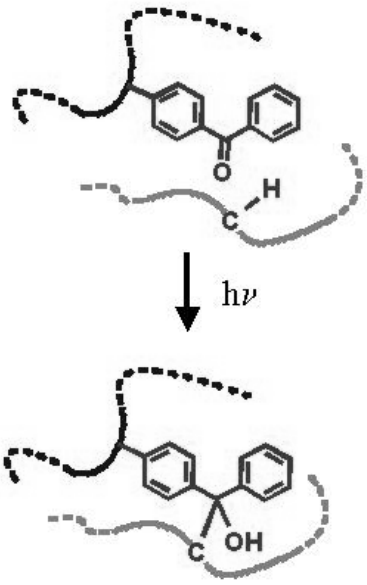

Fig. 1: Illustration of the photoinduced crosslinking of benzophenone containing polymers.

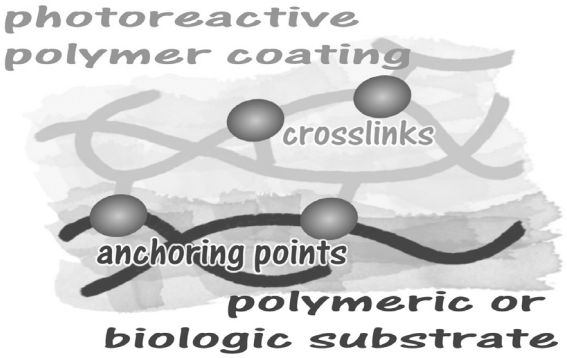

Fig. 2: Schematic illustration of the photochemical process used to generate surface attached polymer networks.

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