NOVEL ROUTE TOWARDS FUNCTIONALIZED PET GRAFTS FOR CARDIOVASCULAR APPLICATIONS

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INTRODUCTION: In Europe alone, over 4.35 million deaths are annually attributed to cardiovascular diseases including aneurysms[1]. The requirements of an aortic prosthesis include the presence of a non-thrombogenic surface, sufficient mechanical strength and host compatibility[2-4]. At present, the most commonly applied prosthetic grafts are manufactured using poly(ethylene terephthalate) (PET)[4]. However, severe drawbacks exist, such as lack of distensile properties and blood incompatibility[4]. Due to the hydrophobic nature of PET, platelets adhere on its surface, thereby generating thrombosis which can result in occlusion of the graft[2] and ultimately in prostheses failure.

METHODS: In the present work, commercially available PET foils (Goodfellow, biaxially oriented) were used as substrates to perform surface modification. Briefly, the modification implies a two-step process in which, first, a prime layer is covalently grafted onto the substrate enabling, in a subsequent step, the attachment of a biopolymer coating (i.e. gelatin). Gelatin has been selected due to its non-toxic nature, biodegradability, low price and cell-interactive properties. The rationale behind is based on the fact that PET is lacking functional groups on its surface, disabling the possibility to graft biopolymers, hence an intermediate "coupling agent" is needed.

RESULTS: Up to now, most gelatin coatings applied on PET implied protein physical adsorption on the surface resulting in an initially stable protein layer, but not durable over time. As a result, a chemical approach to couple gelatin to PET, as reported on herein, is necessary.

An in depth characterization of thus modified-PET was performed using static contact angle measurements, atomic force microscopy and X-ray photoelectron spectroscopy. The stability of the coatings was determined via incubation in PBS at 37°C. In addition, radiolabelling was applied to quantify the gelatin amount present on the PET surfaces. In order to investigate the homogeneity of the protein coating, confocal fluorescence microscopy has been applied.

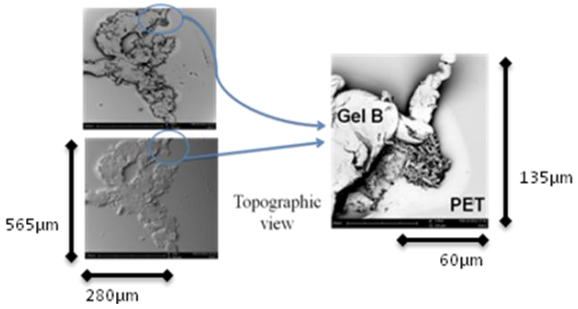

Fig1. SEM images of surface-modified PET with 0.2% gelatin B.

DISCUSSION & CONCLUSIONS: The main aim of the present work was to obtain a stable/durable protein coating on PET for cardiovascular applications. As future perspectives is foreseen a transition of the surface modification strategy from 2D to 3D substrates, tubular structures that can be inserted into veins.

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