

POROUS GELATIN FUNCTIONALIZED POLY- ϵ -CAPROLACTON SCAFFOLDS AS CELL-INTERACTIVE MATERIALS.

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INTRODUCTION: In recent years, a wide variety of polyesters have been evaluated as suitable biomaterials for tissue engineering¹. Most of these polymers however lack cell-interactive properties.

METHODS: To overcome this limitation, we developed a method to functionalise the PCL surface involving a multi-step process in which in a first step (hydro)peroxides were introduced on the PCL surface applying a plasma treatment. The reactive groups introduced were used in a second step for grafting 2-aminoethylmethacrylate (AEMA) as vinyl monomer. In a last step, the primary amine groups were used for covalently coupling gelatine type B (GEL). All reaction steps were analysed using XPS, AFM, SEM and DCA. The cell viability of cell cultured on the materials was assessed by culturing rat Osteocarcoma cells transfected with green fluorescent protein. The procedure developed was also transferred to 3D porous structures produced using the Bioscaffolder technology.

RESULTS & DISCUSSION:

The presence of the polymeric primary amine-groups was qualitatively and quantitatively confirmed using the ninhydrine-assay². XPS measurements further confirmed the presence of nitrogen on the surfaces. Static contact angles decreased from 80° to 50° after 1h grafting, indicating an increased surface wettability. In addition, confocal fluorescence-microscopy demonstrated the presence of polymer grafts on the PCL surface, their distribution and relative shape. In a second step, GEL was immobilised on the surfaces using carbodiimide coupling chemistry. The presence of GEL was confirmed by coomassie staining, fluorescence microscopy and XPS. Applying the functionalised surface in a series of cell culture tests, it can be concluded that the gelatine containing PCL surface on which an additional fibronectin (FN) coating was applied possessed superior cell interactive properties (fig. 1).

Using the Bioscaffolder technology for producing porous scaffolds, we also showed that the method is applicable to 3D scaffolds. An example of a porous PCL scaffolds is shown in fig 2.

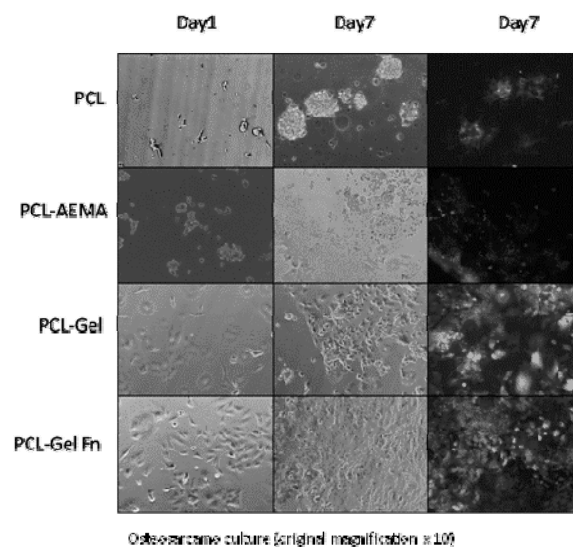


Fig. 1: Cell adhesion to various functionalised PCL films (left and middle: optical microscopy, right: fluorescence microscopy).

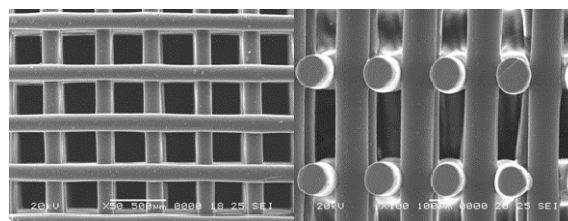


Fig. 2: Porous PCL scaffolds produced using the Bioscaffolder.

CONCLUSIONS: In conclusion, it can be stated that a surface modification approach enabling the introduction of GEL and FN on porous PCL was successfully developed and lead to materials with higher cell-interactivity.

REFERENCES: ¹ DESMET, T., SCHACHT, E. and DUBRUEEL, P. (2008). in *Tissue Engineering: Roles, Materials and Applications*, Eds. Nova Science Publishers, p 141. ² ZHU, Y. B., GAO, C. Y., LIU, X. Y. and SHEN, J. C. *Biomacromolecules* 2002, **3**, 1312

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