PORCINE DERMIS - A SOURCE OF BIOMATERIAL MODELLING BY TISSUE ENGINEERING

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Background. Tissue engineering is a branch of regenerative medical technology that helps replace damaged tissue using appropriate scaffolds, living cells and growth factors. Collagen-based scaffolds are attractive products for various pharmaceutical, dermatological and tissue engineering applications such as wound healing. The use of purified collagen obtained from animal tissue can generate a large number of products that have applications in the medical field and in the manufacture of cosmetic products.

Aim of the study. In this article, we aimed to develop collagen scaffolds from decellularized porcine dermis by tissue engineering and evaluate the biomechanical properties for application in the field of dermatology.

Material and methods. In the case of dense tissues such as porcine dermis, it is extremely important to choose the decellularization protocol that is effective but not aggressive to the tissue in order to preserve the extracellular matrix and especially the proteins that enhance tissue regeneration. DAPI and hematoxylin and eosin stains were used to observe whether the cells were well removed and the scanning electron microscope to study its microstructure. Antigenic properties of collagen scaffolds obtained from porcine dermis were studied. Until a collagen biomaterial is obtained, the decellularized dermis has gone through five steps, such as: enzymatic digestion, extraction, solubilization, neutralization by dialysis, and lyophilization.

Results. (1) DAPI staining shows positive nuclear staining in native tissue indicating the presence of cells and negative nuclear staining in decellularized tissue indicating the absence of cells. (2) H&E staining indicates the presence of cells with purple nuclei in native tissue and decreased cells in decellularized tissue. (3) SEM shows a dense and non-porous native tissue and a cellular free 3D network structure. (4) Quantification of DNA in native and decellularized tissue indicating an approximately 91% decrease in DNA after decellularization. (5) An elastic and flexible sponge with a highly interconnected porous structure was obtained.

Conclusions. Porcine dermis can be processed in order obtain an elastic, flexible collagen sponge with an interconnected porous structure that would promote cell proliferation.

Keywords: porcine dermis, biomaterials, tissue engineering.