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COMPARISON OF SCAFFOLDS OBTAINED BY FILMS AND ELECTROSPINNING FROM NATURAL AND SYNTHETIC POLYMERS

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Tissue engineering uses molecular techniques to manipulate and culture cells, seeking to replace/cure damaged tissues using synthetic or biological materials, aiming at biocompatibility and biodegradability. Thus, it was sought to develop films of chitosan, a polymer abundant in nature, for application in tissue engineering, seeking to accelerate the recovery of damaged tissues. The use of natural polymers in the production of structures used to stimulate cell development and tissue regeneration is a promising strategy in regenerative medicine. In this study, chitosan scaffolds were produced and evaluated regarding their influence on the viability of human keratinocyte. A film with 1% chitosan was made using 1% acetic acid in water as a solvent, using the volumes of the solution of 0, 0.75, 1.5, 2 and 2.5mL in a 24-well plate. These biofilms were kept in an oven at 37°C until completely dry. In each well 0.5 mL of 1M NaOH was added after 1.5h, and thereafter the wells were washed with water. In order to obtain the chitosan scaffold from electrospinning, a solution of 1% chitosan in 1,1,1,3,3,3-hexafluoro-2-propanol was prepared. To perform the method, the distance of the syringe (21G) from the plate was 16 cm, with a velocity of 0.64 mL.h-1 and potential difference of + 13kV. To sterilize the scaffolds, Ultraviolet Radiation (UV) was used for 2h. Cells from the immortalized keratinocyte line (HaCaT) were seeded at a 20,000/well density, directly on well tissue culture plates (TCPs). Cell viability was assessed based on (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide) (MTT) assay after seven days cultivation. The results of MTT showed statistical significance between the cells cultivated in the well-plate (control group) and chitosan. The normalised mean and mean standard error values were obtained from the absorbance results of the HaCat viability cultivated on the chitosan films. They were compared to the tissue culture plate (TCP, used as a control group). The absorbance was 100.0 ± 1.8% for TCP, 25.3 ± 1.8 ($p<0.01$) for the electrospun scaffold and in the groups using chitosan films, the absorbance was 26.8 ± 0.5% for the 0.75mL ($p<0.01$), 40.8 ± 0.9% ($p<0.01$) for the 1.5mL; 44.3 ± 0.7% ($p<0.01$) for the 2mL and 69.0 ± 1.4% for the 2.5ml ($p<0.01$). Compared to the control, there were significant decreases in cell viability in the cultures on the scaffold of chitosan. Electrospun scaffolds had similar viability results with the films. It was observed that there was a trend for increasing cell viability as more film of chitosan was used. Considering the obtained results, the future perspective is to associate the natural polymers with the synthetic ones, aiming at improving the mechanical properties of the biomaterials and cellular viability.