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USE OF ALGINATE HYDROGELS AS A SCAFFOLD IN CULTIVATED CELLS

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The alginic acid sodium salt is a gelling and nontoxic anionic polysaccharide used for the preparation of alginate for tissue engineering and regenerative medicine. The purpose of this research has been to investigate which concentrations and solvents for alginate hydrogels production are suitable for cell cultivation as a strategy in the scaffold production or bioink formulation. Alginate (Sigma-Aldrich), mesenchymal stem cells isolated from human deciduous teeth (MSCs) and immortalized human keratinocytes (HaCat) were used in this study. MSCs were characterized and cultivated in a cell density of 110,000 cells/well in Dulbecco's Modified Eagle's Medium (DMEM) - low glucose; 195,000 HaCat/well were cultivated in DMEM high glucose. The cells were cultivated in a medium with 0, 2.5 and 3% (w/v) of alginate hydrogels solubilized in water, sodium chloride 0.9% (NaCl) or phosphate-buffered saline (PBS) crosslinked with 50mM of calcium chloride (CaCl2) for 30 minutes. Cell viability was assessed by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide test (MTT). When the cells were cultivated at a concentration of 2.5% of alginate with variation in the solvent, they showed similar absorbance values, without a statistical difference ($p = 0.5587$). The results of the mean of absorbance related to viable cells of MSCs and the standard error of the mean (SEM) were 0.13 ± 0.01 using PBS, 0.14 ± 0.01 in water and 0.14 ± 0.01 in NaCl after six days. These results indicated that the solvent used to dissolve the alginate and produce the cell scaffolds did not affect the stem cell viability. The comparison of 0% alginate (well plate used as control), 2.5 and 3% of alginate solubilized in water in the stem cell viability presented differences from the control, with values respectively of 0.09 ± 0.01, 0.14 ± 0.01 ($p < 0.01$) and 0.18 ± 0.01 ($p < 0.01$). The comparison between 2.5 and 3% also showed a statistical difference ($p = 0.0027$), indicating that the higher concentrations of alginate used in the same solvent increased the viability of stem cells. The absorbance averages ± SEM at HaCat cultivated in 3% of alginate after four days were 0.53 ± 0.02 (NaCl), 0.58 ± 0.04 (PBS) and 0.63 ± 0.03 in water, and the control was 0.53 ± 0.01 (0% alginate) showing non-statistically significant tendency ($p=0.070$). The results demonstrated that the use of different solvents did not affect the viability of stem cell and HaCat. However, water as the solvent indicates a tendency for an increase in keratinocytes viability when compared with PBS and NaCl. Therefore, alginate hydrogel in the different solvents tested has shown promising results for use as a scaffold or for the formulation of bioink for the development of bioprinting materials. This polysaccharide can be considered a good candidate for 3D printing since this natural polymer has good cost-benefits.