

## PRODUCTION OF A DOUBLE-NETWORK HYDROGEL USING SODIUM ALGINATE AND NANO-STRUCTURED CELLULOSE TO 3D CELL CULTURES

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### Introduction and objective

2D cell cultures have limitations regarding on tissue representativity. 3D cell cultures can use hydrogels of alginate with cellulose with adequate viscoelasticity properties for cell growth, being from plant sources, abundant and low cost. This work consisted of producing a biocompatible gel from plant sources for three-dimensional cultures, promoting polymeric matrices for cells, helping in cell interactions and nutrient transport, providing mechanical support, self-assembly capacity, biodegradation, ability to reticulation, stability control and mechanical resistance.

### Methodology

Transformation of microcrystalline cellulose into nanofibers was achieved freezing aqueous suspensions on presence of 4M NaOH to proper dissociation of fibers. To obtain suitable dispersion, sodium citrate was added to prevent aggregation. Suspensions were analyzed by Scanning Electron Microscope (SEM), Fourier Transform Infrared Spectroscopy (FTIR), Zeta Potential. For cell viability analysis, murine fibroblastic cell lines (NIH/3T3) were plated ( $2.5 \times 10^5$  cells per well) 24-well plate embedded in gel (100 $\mu$ L).

### Results and discussion

The analysis of cellulose suspensions through SEM, showed a significant change in the size and shape of the structures after hydrolysis, indicating the obtention of structures on a nanometric scale. For the analysis of cellulose aggregation, the zeta potential values indicated that after the addition of sodium citrate, greater dispersion was obtained between the cellulose structures, enabling resistance to the structure in a uniform way. FTIR analysis showed changes in the covalent bonds of the products. Cell viability assay showed structures containing fibroblast cells, alginate and cellulose with 1 cycle of freezing with citrate showed an intact gel structure, with cell aggregates indicating possible cell growth, while the one with only alginate showed dead cells and showed that the hydrogel did not induce cellular toxicity. These results suggest that the hydrolysis of microcrystalline cellulose can lead to obtaining cellulose nanofibers with potential for applications in tissue engineering.

### Conclusions

Hydrogels, they have potential for applications in tissue engineering, since they have mechanical resistance and cell viability. In addition, hydrogels from exclusively vegetable sources, since these are in large quantity, low cost and environmental impact, given that the alginate comes from brown algae found in several coastal regions and the cellulose can be extracted from renewable sources or various vegetable waste from agroindustry.

### References

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