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EXPOQUIMIA

ENGINEERED TRANSPARENT CELLULOSE NANOFIBRIL FILMS FOR STEM-CELL CULTURE

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INTRODUCTION

Retinal progenitor cells (RPCs) derived from induced pluripotent stem-cells are capable of generating retinal lineages.

Their culture requires reproducible, transparent and cell-adhesive substrates.

Matrigel is commonly used, but its animal-derived and poorly defined composition limits standardization.

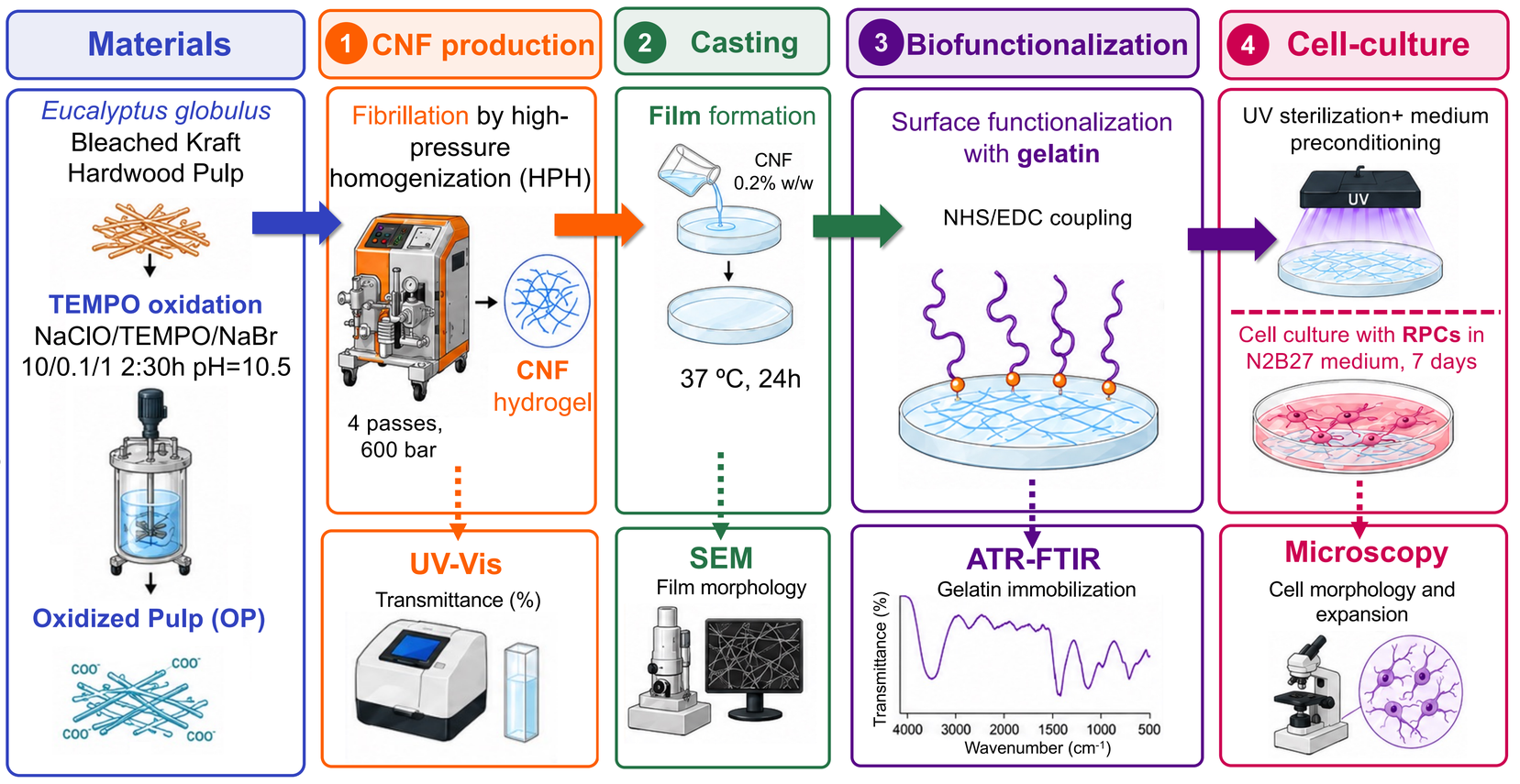


Commercial Matrigel®

OBJECTIVE

- To develop transparent TEMPO-CNF films functionalized with gelatin as bioactive substrates for RPC culture

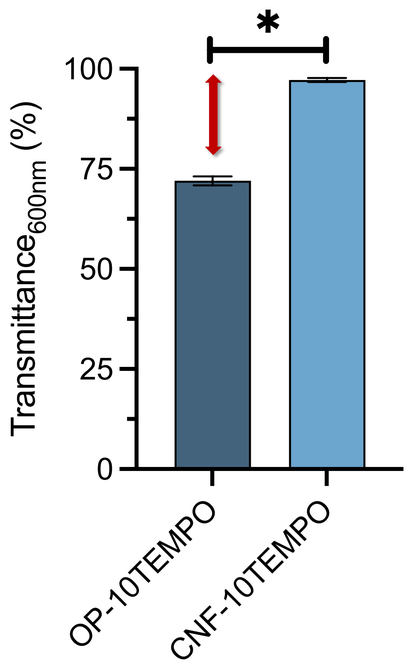
MATERIALS AND METHODS



RESULTS

1 HPH-driven fibrillation improves optical transparency

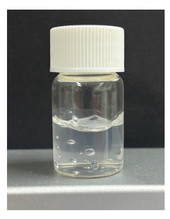
- T% from **71.0 ± 1.1%** to **97.2 ± 0.5%**.
- CNF suitable for optical microscopy.



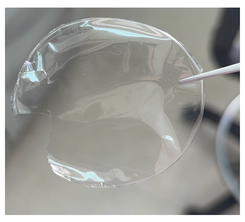
** p-value<0.05*

2 Transparent and stable CNF films

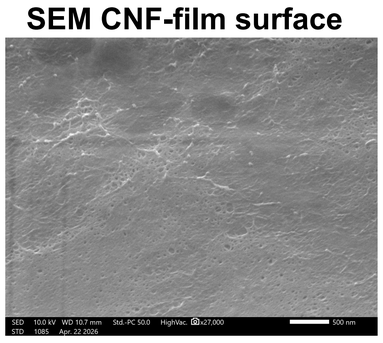
CNF hydrogel



CNF Film



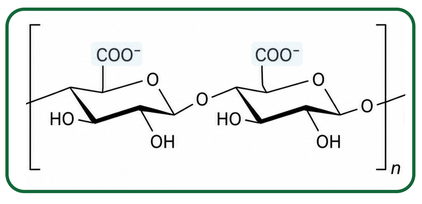
SEM CNF-film surface



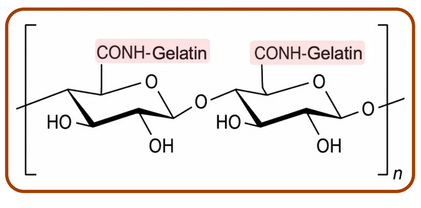
- Homogeneous and self-standing films.
- Nanofibrillar network.
- Compact surface morphology.

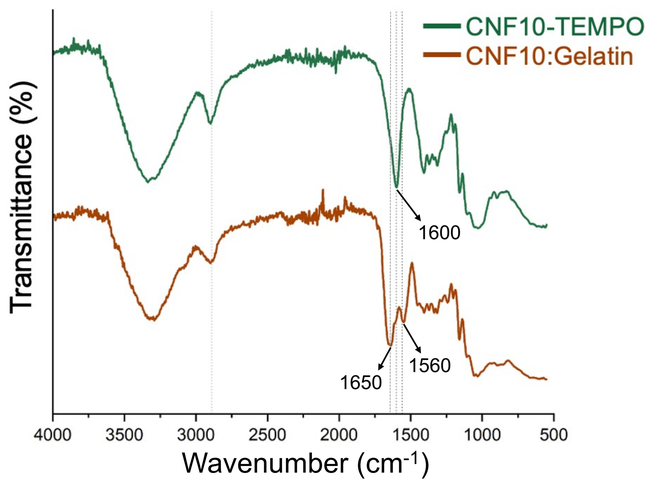
3 Gelatin immobilization confirmed by ATR-FTIR

CNF10-TEMPO



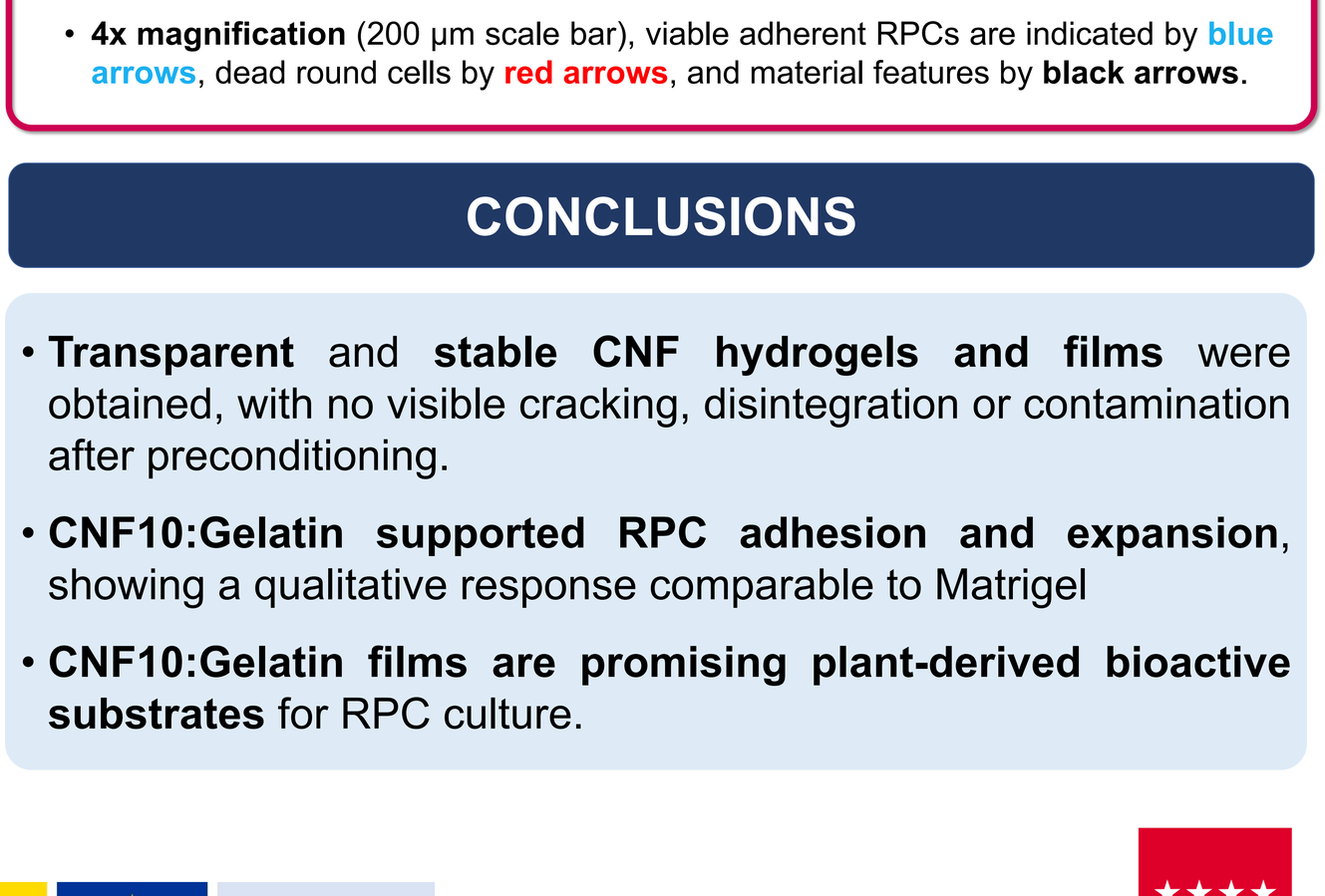
CNF10:Gelatin





- CNF10-TEMPO band at **1600 cm^{-1}**, assigned to carboxylate groups.
- CNF10:Gelatin bands at **1650 cm^{-1} and 1560 cm^{-1}**, assigned to **amide I** and **amide II**, respectively.

4 RPC culture on CNF-based substrates



- Preconditioned CNF films were stable in culture medium, showing **no visible disintegration** and **no microbial contamination**.
- **4x magnification** (200 µm scale bar), viable adherent RPCs are indicated by **blue arrows**, dead round cells by **red arrows**, and material features by **black arrows**.

CONCLUSIONS

- **Transparent** and **stable CNF hydrogels and films** were obtained, with no visible cracking, disintegration or contamination after preconditioning.
- **CNF10:Gelatin supported RPC adhesion and expansion**, showing a qualitative response comparable to Matrigel
- **CNF10:Gelatin films are promising plant-derived bioactive substrates** for RPC culture.

ACKNOWLEDGEMENTS

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